Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

VOLUME 40

1938

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

JAN 14 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. January, 1938. No. 469.

CONTENTS:

Heat as an Insecticide in the Herbarium. *Hugh O'Neill* 1

Notes on the Cladoniae of Connecticut,—III. *Alexander W. Evans* 4

On Pogotrichum filiforme. *R. E. Schuh* 26

Note on Phycological Nomenclature. *Guiseppe DeToni* 27

Echinodorus tenellus, a Correction. *Anne E. Perkins* 27

Najas gracillima in Missouri. *Julian A. Steyermark* 28

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 70. January, 1938. No. 469.

HEAT AS AN INSECTICIDE IN THE HERBARIUM

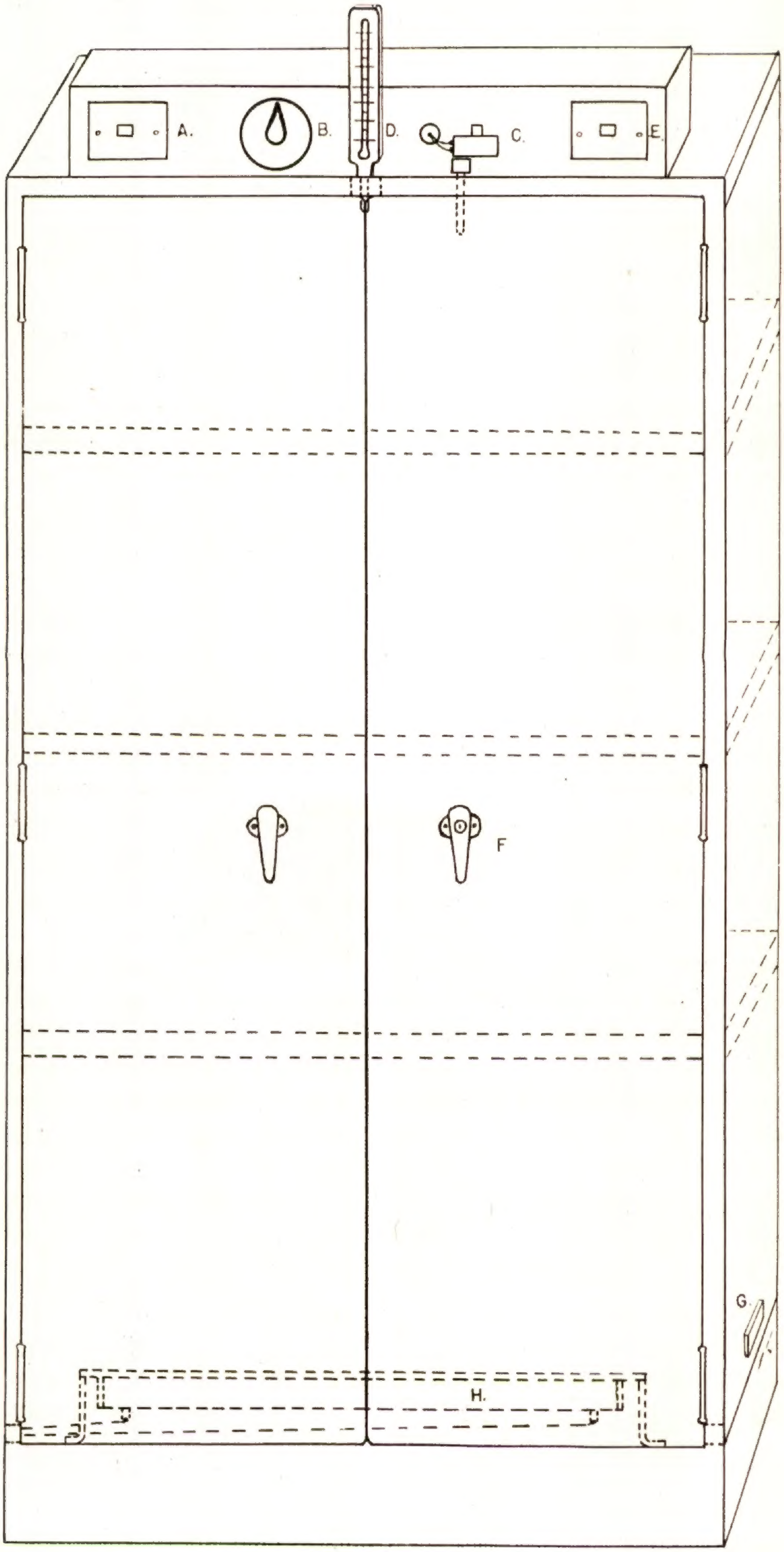
Hugh O'Neill

Insect pests in plant collections are controlled (a) by poisoning the specimens; (b) by periodical fumigation; (c) by the use of repellants; (d) by some combination of these three methods.

In "La Conservazione degli Erbari e l'efficacia del Sublimato (Hg Cl_2) nell' avvelamento delle piante," Passerini and Pampini[1] discuss the relative efficiency of various poisons and fumigants. All poisons are objectionable in that they are poisonous to the botanist as well as to the insect. Fumigants are objectionable because they are either poisonous to man, or explosive or have disagreeable odors. Repellants are efficient only when used in conjunction with some insecticide. All of these methods kill the eggs of insects only after relatively long periods of time. If the eggs are in fruits, such as acorns or haws, they are usually not killed by any of these methods.

Insects are killed by heat at comparatively low temperatures, e. g. the Mediterranean Fruit Fly (*Ceratites capitata*) is killed in ten hours in any stage (egg as well as larva or pupa) by a temperature of 110° F or 43° C. Museum beetles (*Dermestes*), weevils, roaches, tripetids in acorns, gall-worms in stems were found by the author to succumb as easily to mild temperatures. These tests were made in a steel case designed by the writer and figured herewith. The case is of the same style, finish and construction as the steel cabinets in this herbarium (i. e. substantially the same as those in use in the Gray Herbarium) except that the walls and the doors are of double layers of sheet steel with asbestos filling between the layers. The insulation greatly re-

[1] Soc. Bot. Ital. (Firenze) Nuova Serie Vol. 34. (1927).


A.
B.
D.
C.
E.
F
G.
H.

duces loss of heat by radiation through the walls and doors and also makes the apparatus fireproof according to the Underwriters' inspection.

In order to preclude the remotest possible chance of plants taking fire, specimens are never placed on the lowest shelf. On this lowest shelf may be placed a pan of water to prevent excessive drying of specimens.

On account of the low conductivity of the sheets of paper and of the plants themselves, the transfer of heat from the outside of a bundle of plants to the inside takes place very slowly. In practice this may be overcome safely by using a temperature of about 170° F or 77° C. In about 4 to 6 hours this will raise the temperature in the inside of a bundle of plants to about 140° F (60° C), a temperature sufficient to kill insects in any stage in a few minutes without damaging the plant specimens in any way. In fact, in drying plants between corrugated cardboard and blotters, as ordinarily practiced in the tropics, the plants are often subjected to considerably higher temperatures. It is believed that this method of killing insects is more thorough and more rapid and less expensive than any known method. In contrast to the commonly used insecticides it is: (a) Not poisonous (as are hydrogen cyanide, mercury bichloride, sodium arsenite, carbon bisulfide, sulphur dioxide); (b) Not explosive (as are hydrogen cyanide, carbon bisulfide); (c) It really kills all eggs of insects in large fruits in a few hours.

A vent in the roof of the cabinet and a vent in either wall (G) near the floor converts the heat-treater into an efficient apparatus for drying plants in presses made of corrugated cardboard and blotters.

The apparatus figured here, has been used since June 1933 to treat nearly 200,000 sheets of plants as well as a collection of fungi. No insect pests have been discovered in the plants in this herbarium since that date.

The specifications of this heat-treating cabinet are as follows: Height 70 inches; Width 37 inches; Depth 24 inches. Capacity 3000 to 6000 mounted or unmounted herbarium specimens.

Explanation of Figure

(H) Two 500-watt 110-volt space heaters connected in series paralleled with (B) a three-heat indicating switch located at top of cabinet. Each of these heaters is bolted to a 4″ x 30″ x 1/8″ plate with ¼″ asbestos board between plate and heater. Plate is supported 2″ above bottom of cabinet and placed 7″ and 15″ inside and parallel to front surfaces.

(C) Immersion type mercoid thermal cutout having a range of approximately 120–200° F. This regulator is wired in series with the supply line.

(A and E) Two candelabra base pilot receptacles containing Neon lamps behind a suitable bull's-eye, one pilot across heater elements and one across line ahead of thermal cutout and switch. This to enable operator to tell when (A) cabinet is connected to line when (E) heater is operating. Not shown on diagram is a receptacle at (I) left side of cabinet 8″ from floor to allow connection by means of a two conductor no. 14 asbestos heater cord.

Four shelves made of no. 10 wire woven in a one-inch diamond mesh and welded to a suitable frame are shown by double horizontal dotted lines.

(G) Three ventilation holes cut through cabinet one at each side near bottom and one in the top, each hole approximately 3″ x 6″ and fitted with reasonably tight covers.

(D) Thermometer indicating air temperature inside cabinet.

(F) Handles to doors.

Specifications for the electrical equipment were drawn by Mr. Robert E. Robson.

LANGLOIS HERBARIUM,
CATHOLIC UNIVERSITY OF AMERICA,
WASHINGTON, D. C.

NOTES ON THE CLADONIAE OF CONNECTICUT—III[1]

ALEXANDER W. EVANS

THE present series of notes represents the third supplement to the writer's report on the Cladoniae of Connecticut,[2] published in 1930. This report was based on collections made down to the close of 1928. The first supplement[3] brought the record down to 1931, and the second[4] to 1933. In this third supplement the record is brought down to the close of 1936. The writer has again enjoyed the kind cooperation of Dr. Heinrich Sandstede of Bad Zwischenahn, Oldenburg, in the preparation of this paper and would again extend to him his grateful thanks. Dr. Sandstede has examined the majority of the specimens listed and has commented on some of the more critical species, varieties, and forms.

The names of most of the collectors mentioned on the following pages have already appeared in the writer's earlier papers on Cladoniae. During the past three years a number of additional botanists have sent in material for study, and a few specimens of earlier date have come to light. The new names, which will be cited in connection with individual specimens, are as follows: Miss Dorothy Arnold, B. Livings-

[1] Contribution from the Osborn Botanical Laboratory.
[2] Trans. Connecticut Acad. **30**: 357–510. 1930.
[3] RHODORA **34**: 121–142, 153–164. 1932.
[4] *Ibid.* **37**: 33–57. 1935.

ton, R. Darrow, G. R. Kleeberger, H. R. Muegel, C. E. Olmsted, W. A. Setchell, and A. G. Snow. The specimens collected by Livingston, Kleeberger, and Setchell are fifty years old or more, but most of the other specimens listed are of recent date. The collections made by Mr. H. R. Muegel of the University of Cincinnati have been of especial interest and have added appreciably to our knowledge of the local distribution of the Cladoniae in Connecticut. Records cited with dates only are based on collections made by the writer, and all records, unless especially noted, are represented by specimens in the Yale Herbarium.

The long-awaited Lichen Flora[1] by Professor Bruce Fink, completed for publication by Joyce Hedrick, appeared in 1935. The treatment of the genus Cladonia in this important work is somewhat at variance with the treatment in the writer's publications. This is largely due to the broader definition of certain species and to the almost complete disregard of chemical distinctions. As an example of broad definition *C. fimbriata* may be considered. In the Fink Flora this species includes seven varieties, whereas five of these varieties are regarded as distinct species in the writer's report and notes. As examples of the disregard of chemical distinctions the inclusion of *C. clavulifera* under *C. subcariosa* and of *C. mitis* under *C. sylvatica* may be selected. The Fink treatment of the genus is, on the whole, in accordance with the views of Tuckerman; the writer's treatment on the contrary is more in accordance with the views of Vainio and Sandstede.

The study of chemical distinctions in the Cladoniae has been greatly advanced by Asahina's recommendation of paraphenylenediamine[2] for the detection of fumarprotocetraric acid. Students of the Cladoniae had heretofore attempted to demonstrate the presence of this wide-spread acid by means of its bitter taste, but this method is far from satisfactory because to many persons the bitter taste is either elusive or wholly imperceptible. Paraphenylenediamine, however, if fumarprotocetraric acid is present, gives a definite color reaction, a yellow quickly deepening to orange-red or brick-red. To obtain this reaction the reagent should be applied to dry material in the form of a freshly prepared alcoholic solution.[3] Although most of the specimens which had been pronounced bitter by Sandstede and by

[1] The Lichen Flora of the United States i–x, 1–426, *f. 1–4*, *pl. 1–47*. Ann Arbor 1935.

[2] Ueber die Reaktion von Flechten-Thallus. Acta Phytochimica **8**: 47–64. 1934.

[3] For further details see Torrey, Paraphenylenediamine, a new color test for lichens. Torreya **35**: 110–112. 1935.

Robbins react positively with the new reagent, whereas those which had been pronounced mild react negatively, a few exceptions have been met with. These were particularly evident in plants which had been referred to *C. chlorophaea* or *C. Grayi* on the basis of differences in taste. For this reason the lists of stations under these two species are completely revised in the present paper, according to the results obtained with paraphenylenediamine.

Although the new reagent gives an orange-red or brick-red color with fumarprotocetraric acid, these colors are not absolutely diagnostic for this particular acid. Similar colors are obtained, for example, with *C. macilenta*, *C. digitata*, and *C. delicata*, in spite of the fact that fumarprotocetraric acid has not been demonstrated in any of these species by chemical analysis. The reaction in these cases is obviously due to the presence of thamnolic acid, to which Asahina assigns a yellow color, deepening to orange- or brick-red when treated with paraphenylenediamine. It will be remembered that thamnolic acid gives a deep yellow color when acted upon by potassium hydroxide. In certain Cladoniae paraphenylenediamine gives a yellow color which does not deepen to orange or reddish. This is the case, for example, with *C. squamosa* f. *levicorticata*, although other forms of this polymorphic species, such as f. *denticollis*, are definitely negative. Apparently various substances might be responsible for this persistent yellow color. In the following list the reactions of the various species with paraphenylenediamine are indicated by means of the symbols P+ and P−. P+ signifies a positive reaction, in which a definite reddish color is obtained; P− a negative reaction or one in which the color is not reddish.

Fifty-three species of Cladonia were known from Connecticut at the close of 1933, and two additional species have been detected since that date. Unfortunately *C. impexa*, one of the species included in the writer's original report (p. 386), can no longer be considered a member of the Connecticut flora. This species is negative with paraphenylenediamine, but all the specimens upon which the Connecticut records were based are positive and must therefore be transferred to *C. sylvatica* or *C. tenuis*. The total number of species for the State, therefore, is fifty-four. It is hoped that the true *C. impexa* may yet be discovered within our limits. According to our present knowledge it is more northern than our other species of Cladina, although found in eastern Massachusetts.

The sequence of species in the present series of notes is the same as in the writer's earlier papers on Cladonia and all page-references, unless otherwise noted, relate to the original report of 1930. The first series of notes is indicated by "Notes" and the second series by "Notes II." Species or forms reported for the first time from Connecticut are distinguished by asterisks.

Subgenus CLADINA

CLADONIA RANGIFERINA (L.) Web. (p. 375). P+. Canaan (1936), Kent (*Muegel*, 1936), Middletown (*Muegel*, 1935), Pomfret (*Mrs. Paine*, 1934), Somers (1934), Warren (1934), and Woodbridge (1935).

*CLADONIA RANGIFERINA f. INCRASSATA Schaer. Lich. Helv. Spic. 38. 1823 (*as C. rangiferina incrassata*). On earth in a field, Goshen (1934, det. Sandstede).

The podetia in this form are more robust than in the usual forms of the species, and the surface in the older parts is wrinkled and verruculose.

CLADONIA RANGIFERINA f. TENUIOR (Del.) Mass. (Notes, p. 122). Farmington (1934).

*CLADONIA RANGIFERINA f. LEUCITICA Flot. in Sandstede, Abhandl. Naturw. Ver. Bremen **25**: 94. 1922. On earth in a field, Simsbury (1936, det. Sandst.).

According to Sandstede f. *leucitica* is a shade plant and is distinguished by its sparse branching and pale color, with only the extreme tips of the ultimate branchlets showing a brownish pigmentation.

CLADONIA RANGIFERINA f. UMBELLATA Anders (Notes II, p. 35). Canaan (1936) and Goshen (1934, det. Sandstede).

CLADONIA RANGIFERINA f. PROLIFERA Flot. (p. 377). Goshen (1934).

CLADONIA SYLVATICA (L.) Hoffm. (p. 378). P+. Barkhamsted (*McDonnell*, 1933; *Evans*, 1934), Durham (1932), Farmington (1934), Goshen (1934, 1935, det. Sandstede), Kent (*Muegel & Evans*, 1936), Madison (*Muegel*, 1935, the earlier record for this town was based on specimens of *C. mitis*), Milford (1932), New Haven (*Livingston*, 1873, not earliest record for town), Torrington (1934, det. Sandstede) and Warren (1934). The specimens dated 1932 or 1933 have been incorrectly listed as *C. mitis* (see Notes II, p. 36).

CLADONIA SYLVATICA f. SPHAGNOIDES (Floerke) Oliv. (p. 380). New Haven (*Hall*, 1874, Hall Herbarium, listed on p. 387 as *C. impexa* f. *laxiuscula*).

CLADONIA SYLVATICA f. PYGMAEA Sandst. (p. 381). Branford (1936), Middletown (1935), Warren (1934, det. Sandstede), and Woodbridge (1935).

*CLADONIA SYLVATICA f. SETIGERA Oxner ex Sandstede in Raben-

horst, Kryptogamen-Flora **9**, Abt. 4^2: 46. 1931. On earth in fields. Branford (1928), Torrington (1934, det. Sandstede) and Union (1927). The specimens from Branford and Union have been incorrectly listed as *C. mitis* (see Report, p. 381).

The minute hair-like or needle-like appendages which characterize f. *setigera* are originally pale in color but may become darkened with age. They are rather sparingly produced in most cases and occur along the sides of the podetia as well as at the tips of the ultimate branchlets. The form is analogous to *C. tenuis* f. *setigera*.

CLADONIA MITIS Sandst. (p. 381). P−. Canterbury (1933, not new to town), Colchester (1935), Eastford (1934), Griswold (1933, not new to town), Hartland (1934), Killingworth (Hall, 1874, antedating record in Notes II, p. 36; *Evans*, 1932), Ledyard (*L. Sudbury*, 1927, not previously reported), Lyme 1930, not new to town), Madison (1927, not new to town), Mansfield (1934), North Haven (*Britton*, 1901, antedating records in Report, p. 381), Oxford (1936), Shelton (1928, not new to town), Somers (1934), and Voluntown (1933). The specimens upon which these records are based are all negative with paraphenylenediamine. Those dated 1933 or earlier have been incorrectly listed as *C. sylvatica* (see Report, p. 378; Notes, p. 123; and Notes II, p. 36).

CLADONIA MITIS f. PROLIFERA Sandst. (p. 383). Bethany (*Muegel*, 1935), North Branford (*Musch & Evans*, 1927), Shelton (1928, not new to town), Somers (1934), and Wilton (1931). These specimens (with the exception of the third) have been incorrectly listed as *C. sylvatica* f. *prolifera* (see Report, p. 381, and Notes, p. 123); they are all negative, however, with paraphenylenediamine. The true *C. sylvatica* f. *prolifera* has not yet been found in Connecticut.

CLADONIA TENUIS (Floerke) Harm. (p. 384). P+. Barkhamsted (1928, incorrectly listed in Report, p. 386, as *C. impexa;* not new to town), Bloomfield (1936), Canaan (1936), Colchester (1934), Coventry (1934), Farmington (1934), Glastonbury (1934), Groton (1936), Mansfield (1934), New London (1936), Oxford (1936), Pomfret (*Mrs. Paine*, 1934), Sharon (1936), Somers (1934) Torrington (1934), Warren (1904), Windsor (*Britton*, 1900, Britton Herbarium, antedating record in Report, p. 384), and Woodbury (1936).

CLADONIA TENUIS f. FLAVICANS (Floerke) Harm. (p. 385). Killingworth (*Hall*, 1874, det. Sandstede, earliest record for Connecticut). This specimen has been incorrectly listed as *C. impexa* (see Report, p. 386).

CLADONIA TENUIS f. SETIGERA Sandst. (Notes, p. 123). Chester (*Musch & Evans*, 1928), Clinton (1935), Colchester (1934), Coventry (1934), East Haddam (1934), Enfield (1934), Hartland (1934), Ledyard (*Musch & Nichols*, 1925), Mansfield (1934), North Canaan (1928), Old Saybrook (1928), Pomfret (*Mrs. Paine*, 1934), Salem

(1935), Southbury (1926), Southington (1935), Warren (1934), Washington (1922), Westbrook (1935), and Woodbury (1936). The specimens dated 1928 or earlier have all been incorrectly listed as *C. impexa* (see Report, p. 386) or as *C. impexa* f. *laxiuscula* (see Report, p. 387). These specimens, although showing more or less superficial disintegration, give a positive reaction with paraphenylenediamine and must therefore be excluded from *C. impexa,* which is definitely negative.

Subgenus PYCNOTHELIA

Cladonia papillaria (Ehrh.) Hoffm. f. molariformis (Hoffm.) Schaer. (p. 390). P−. Colchester (1934), Farmington (1934), Goshen (1934), Plainville (1935). Pomfret (1934), Salem (1935), Salisbury (1935), and Southington (1935, 1936).

Cladonia papillaria f. papillosa Fr. (p. 391). Colchester (1934), Goshen (1934), North Branford (*Muegel,* 1935), Pomfret (1934), Salem (1935), and Southington (1935, 1936).

Cladonia papillaria f. epistelis Sandst. (Notes, p. 123). Branford (1936, determination verified by Sandstede).

Subgenus CENOMYCE

Section Cocciferae

Subsection Subglaucescentes

Cladonia Floerkeana (Fr.) Floerke var. intermedia Hepp (p. 393). P−. Bethany (1935), Coventry (1934), Guilford (1936), Southington (1936), and Torrington (1934).

Cladonia Floerkeana var. carcata (Ach.) Vainio (p. 394). Barkhamsted (1934), Bethany (1935), Coventry (1934), Kent (1936), Salisbury (*Darrow,* 1935), and Southington (1936).

Cladonia Floerkeana var. carcata f. squamosissima (Th. Fr.) Vainio (p. 394). Barkhamsted (1934).

Cladonia bacillaris (Ach.) Nyl. (p. 395). P−. Bloomfield (1936), Bristol (1934), Colchester (1934), Farmington (1934), Glastonbury (1934), Goshen (1934), Killingly (1934), Mansfield (1934), Norwich (1935), Oxford (1936), Pomfret (*Mrs. Paine,* 1934), Salem (1935), Southington (1935), Stratford (1934), Southington (1936), Thomaston (1935), Torrington (1934), Winchester (1935), and Woodbury (1936).

Cladonia bacillaris f. clavata (Ach.) Vainio (p. 397). Beacon Falls (*Muegel,* 1936), Farmington (1934), Salem (1935), Sharon (1936), and Voluntown (1935).

Cladonia bacillaris f. peritheta (Wallr.) Arn. (p. 397). Bethany (1935, det. Sandstede) and Voluntown (1935).

Cladonia bacillaris f. reagens Evans (p. 397). Southington (1935).

Cladonia bacillaris f. subtomentosula Sandst. (Notes II, p. 38). Bethany (1935), Branford (1936), Canaan (*Muegel,* 1936), and Goshen (1934).

CLADONIA BACILLARIS f. PITYROPODA Nyl. (Notes II, p. 38). Goshen (1934).

CLADONIA BACILLARIS f. TENUISTIPITATA Sandst. (Notes II, p. 39). Torrington (1934).

CLADONIA BACILLARIS f. ABBREVIATA (Vainio) Harm. (Notes, p. 124). Barkhamsted (1934), Eastford (1934), East Haddam (1934), Kent (1936), and North Canaan (1936). These specimens, with the exception of the last, were determined by Sandstede.

CLADONIA MACILENTA Hoffm. f. STYRACELLA (Ach.) Vainio (p. 399). P+. Colchester (1935), Goshen (1934), Killingly (1934), and Litchfield (1936).

CLADONIA MACILENTA f. GRANULOSA Aigret (p. 400). Goshen (1934) and Winchester (1935).

*CLADONIA DIGITATA (L.) Hoffm. Deutschl. Fl. **2**: 124. 1796. *Lichen digitatus* L. Sp. Plant. 1152. 1753. P+. On logs, tree-bases, or soil rich in humus. Canaan (*Muegel*, 1936).

Although the synonymy given above is correct, so far as the names are concerned, it is by no means certain that the plants called *Lichen digitatus* by Linnaeus and those called *Cladonia digitata* by Hoffmann are the same as those now called *C. digitata*. Vainio,[1] in fact, accredits the name simply to Schaerer (Lich. Helv. Spic. 22, 1823), on the basis of specimens in the Schaerer Herbarium, which agree with the modern conception of the species. According to the International Rules of Botanical Nomenclature, adopted in 1930, the citation of Schaerer as author is incorrect, since Article 47 distinctly states: "an alteration of the diagnostic characters or of the circumscription of a group does not warrant the citation of an author other than the one who first published the name."

The distribution of *C. digitata* is circumpolar, and the species has long been known from Canada and northern New England, as well as from the Adirondacks and Appalachians. The specimens from Canaan are scanty, and the few podetia present are very irregularly developed. The plants are therefore referred simply to the species. Aside from the illustrations of *C. digitata* in European works, Torrey's excellent figures of North American specimens should be consulted.[2]

The primary squamules of the present species are larger than in any other member of the Cocciferae and are variously lobed or incised. The upper surface varies from grayish green to olive green and the lower from whitish to yellowish, deepening to brownish orange toward the base. In most cases fine soredia are present, especially along the

[1] Acta Soc. F. et Fl. Fennica **4**: 123. 1887.
[2] Torreya **34**: *pl. 1, f. 3*. 1934.

margins. The podetia, in their most characteristic development, form distinct cups, which broaden out gradually from the base, but in certain forms the cups are irregular and indistinct and may even be replaced by more or less pointed structures. The podetial cortex, which is restricted to the lower part, presents a smooth or wrinkled appearance. Above the base patches of fine soredia appear in the cortex, and the upper part of the podetia is densely covered with similar soredia, which show a whitish or pale yellowish color, occasionally tinged with greenish. The scarlet apothecia are normally borne on the margins of the cups, but many of the podetia are sterile.

One of the most striking peculiarities of *C. digitata* is its distinct reaction with KOH, which gives a vivid yellow color, owing to a relatively large content of thamnolic acid. In this respect the species resembles *C. macilenta*, but in the latter the primary squamules are much smaller and the podetia never from true cups.

Cladonia didyma (Fée) Vainio f. subulata Sandst. (Notes, p. 127). P—. Guilford (1936).

Subsection Stramineo-flavidae

Cladonia pleurota (Floerke) Schaer. (p. 400). P—. Bethany (1935), Bloomfield (1936), Glastonbury (1934), Goshen (1934), Hartford (*Clark*, 1933, det. Sandstede, not previously reported), Lisbon (*Marshall & Evans*, 1935), Norwich (1935), Salem (1935), Salisbury (1935), Somers (1934), Southington (1935), Thomaston (1935), Warren (1934), Westbrook (1935), and Woodbury (1936).

Cladonia pleurota f. decorata Vainio (p. 402). Barkhamsted (1934), Guilford (1935), and Pomfret (*Mrs. Paine*, 1934).

Cladonia cristatella Tuck. f. Beauvoisii (Del.) Vainio (p. 405). P—. Bristol (1934), Canaan (*Muegel*, 1936), Colchester (1934), Lisbon (1935), Mansfield (1934), New London (1936), Norwich (1935), Oxford (1936), Plainville (1935), Pomfret (*Mrs. Paine*, 1934), Salem (1935), Somers (1934), Stratford (1934), Warren (1934), Westbrook (1935), Winchester (1935), and Woodbury (1936).

Cladonia cristatella f. vestita Tuck. (p. 407). Bristol (1934), Colchester (1934), Lisbon (1935), Naugatuck (1936), New London (1936), Norwich (1935), Plainville (1935), Pomfret (*Mrs. Paine*, 1934), Salem (1935), Somers (1934), Stratford (1934), Warren (1934), Winchester (1935), and Woodbury (1936).

Cladonia cristatella f. squamosissima Robbins (p. 408). Bethany (*Muegel*, 1935) and Voluntown (1935).

Cladonia cristatella f. pleurocarpa Robbins (p. 408). Mansfield (1934), Oxford (1936), and Stratford (1934).

Cladonia cristatella f. scyphulifera Sandst. (Notes II, p. 41), Colchester (1935) and Mansfield (1934).

CLADONIA CRISTATELLA f. AURANTIACA Robbins (Notes II, p. 41). Madison (*Muegel & Evans*, 1935) and New London (1936).

CLADONIA CRISTATELLA f. OCHROCARPIA Tuck. (p. 409). Woodbury (1936).

CLADONIA INCRASSATA Floerke (Notes, p. 129). P—. Canaan (1936), Mansfield (1934), Naugatuck (1936), and Southington (1936).

Section OCHROPHAEAE

Subsection UNCIALES

CLADONIA UNCIALIS (L.) Web. (p. 413). P—. Eastford (1934), Middletown (*Muegel*, 1935), Oxford (1936), Pomfret (*Mrs. Paine*, 1934), Somers (1934), Voluntown (1935), Warren (1934), and Westbrook (1935). The earlier record for Westbrook (p. 414) was based on specimens of *C. caroliniana* f. *dilatata* (Notes, p. 138).

CLADONIA UNCIALIS f. SETIGERA Anders (Notes, p. 134). Bethany (*Muegel & Evans*, 1935). Hartland (1934), Naugatuck (1936), Voluntown (1935), and Westbrook (1935).

CLADONIA UNCIALIS f. SPINOSA Oliv. (p. 417). Voluntown (1935).

CLADONIA UNCIALIS f. SORALIGERA Robbins (Notes II, p. 42). Groton (1936), Salisbury (1935), and Voluntown (1935).

CLADONIA CAROLINIANA (Schwein.) Tuck. f. DILATATA Evans (Notes, p. 138). P—. Cornwall (*Underwood*, 1890), Farmington (1934), Goshen (*Underwood*, 1890), Groton (1936), and Middletown (*Muegel*, 1935). The specimens from Cornwall have been listed as *C. uncialis* f. *obtusata* (p. 415) and those from Goshen as *C. uncialis* (p. 413). Both are in the Underwood Herbarium at the New York Botanical Garden.

CLADONIA CAROLINIANA f. FIBRILLOSA Evans (Notes, p. 139). Clinton (1935).

CLADONIA CAROLINIANA f. TENUIRAMEA Evans (Notes, p. 139). Bloomfield (1936), Naugatuck (1936), Salem (1935), and Westbrook (1935).

CLADONIA CAROLINIANA f. PROLIFERA Evans (Notes, p. 139). Glastonbury (1934) and Salisbury (1935).

CLADONIA BORYI Tuck. f. LACUNOSA (Bory) Tuck. (p. 418). P—. Canaan (*Muegel*, 1935), Groton (1936), Guilford (1935), Middletown *Muegel & Evans*, 1935), North Canaan (*Muegel*, 1936), and Salisbury (1935).

Subsection CHASMARIAE

Group MICROPHYLLAE

CLADONIA FURCATA (Huds.) Schrad. (p. 420). P+. East Haddam (1934). This specimen is indefinite as to form.

CLADONIA FURCATA var. RACEMOSA (Hoffm.) Floerke (p. 422). Bloomfield (1936), Clinton (1935), Eastford (1934), Goshen (1935), Guilford (1935), Kent (1936), Somers (1934), Winchester (1935), and Woodbridge (1935).

CLADONIA FURCATA var. RACEMOSA f. FURCATOSUBULATA (Hoffm.) Vainio (p. 422). Clinton (1935), Litchfield (1936), Oxford (1936, det. Sandstede), and Salem (1935).

CLADONIA FURCATA var. RACEMOSA f. CORYMBOSA (Ach.) Vainio (p. 423). Guilford (1936).

CLADONIA FURCATA var. RACEMOSA f. FISSA (Floerke) Aigret (Notes, p. 153). Canaan (1936, det. Sandstede).

*CLADONIA FURCATA var. RACEMOSA f. RACEMOSELLA (Floerke) Sandst. in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 204. 1931. *Cladonia furcata* *ζ. *fissa* subvar. *racemosella* Floerke, Clad. Comm. 152. 1828. On earth in a field. Goshen (1935, det. Sandstede).

Although this form is recognized by Sandstede it comes very close to f. *corymbosa*. It is characterized by the small and regular tufts which the podetia form and by the more or less fissured cortex in the vicinity of the apothecia.

CLADONIA FURCATA var. RACEMOSA f. SQUAMULIFERA Sandst. (Notes, p. 153). Bloomfield (1936), Branford (1936), Canaan (*Muegel*, 1936), Enfield (1934), Kent (1936), New Haven (*Kleeberger*, 1874, earliest record for town), Pomfret (*Mrs. Paine*, 1934), Portland (1934), Thomaston (*McDonnell*, 1935), Voluntown (1935), Warren (1935), Westbrook (1935), Woodbridge (*Muegel & Evans*, 1935), and Woodbury (1936).

CLADONIA FURCATA var. PALAMAEA (Ach.) Vainio (p. 425). Coventry (1934), Farmington (1934), Goshen (1934), Mansfield (1934), and Pomfret (*Mrs. Paine*, 1934).

CLADONIA FURCATA var. PINNATA (Floerke) Vainio (p. 424). Goshen (1935).

CLADONIA FURCATA var. PINNATA f. FOLIOLOSA (Del.) Vainio (p. 424). Warren (1935).

CLADONIA FURCATA var. PINNATA f. RECURVA (Hoffm.) Zahlbr. (Notes II, p. 44). Canaan (1936, det. Sandstede).

CLADONIA SCABRIUSCULA (Del.) Leight. f. FARINACEA (Vainio) Sandst. (p. 427). P+. Bethany (*Muegel*, 1935), Bristol (1934), Enfield (1934), Farmington (1934), Goshen (1934), Kent (1936), Oxford (1936), Pomfret (*Mrs. Paine*, 1934, det. Sandstede), Somers (1934), Woodbridge (*Muegel*, 1935), and Woodbury (1936).

CLADONIA MULTIFORMIS Merrill f. FINKII (Vainio) Evans (p. 429). P+. Canaan (1936), Goshen (1935), and Torrington (1934).

CLADONIA MULTIFORMIS f. SIMULATA Robbins (p. 429). Winchester (1935).

CLADONIA MULTIFORMIS f. SUBASCYPHA (Vainio) Evans (p. 430). Canaan (1936) and Goshen (1934).

CLADONIA SQUAMOSA (Scop.) Hoffm. (p. 432). P−. Norwich (*Setchell*, about 1886, not previously reported, Farlow Herbarium) and Warren (1935). These specimens are indefinite as to form.

CLADONIA SQUAMOSA f. DENTICOLLIS (Hoffm.) Floerke (p. 434). Thomaston (1935, det. Sandstede).

CLADONIA SQUAMOSA f. SQUAMOSISSIMA Floerke (p. 434). Canaan (*Muegel & Evans*, 1936) and Middletown (1935).

CLADONIA SQUAMOSA f. MURINA Scriba (p. 437). Branford (1936), Canaan (1936, det. Sandstede), and Woodbridge (1935, det. Sandstede).

CLADONIA SQUAMOSA f. CALLOSA (Del.) Anders (Notes II, p. 45). Bethany (1935, det. Sandstede) and Woodbridge (1935).

*CLADONIA SQUAMOSA f. FRONDOSA (Del.) Mass. Lich. Ital. Exsic. 292B. 1855; Sched. Crit. 159. 1855. *Cenomyce squamosa* δ. *frondosa* Del. in Duby, Bot. Gall. 625. 1830. On shaded rocks, Canaan (1936, det. Sandstede). For the characteristics of this form see Evans.[1]

*CLADONIA SQUAMOSA f. MURICELLA (Del.) Vainio, Acta Soc. F. et Fl. Fenn. **4**: 431. 1887 (as *C. squamosa* δ. *muricella*); Sandstede in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 271. 1931 (as form). *Cenomyce squamosa muricella* Del. in Duby, Bot. Gall. 626. 1830. *Cladonia squamosa* var. *muricella* Zahlbr. Cat. Lich. Univ. **4**: 599. 1927. On rocks, Branford (1936, det. Sandstede).

The present form agrees with f. *phyllocoma* (p. 432) in having squamulose podetia but differs in being nearly or quite cupless. The tips of the branches, instead of forming cups, run out into long points or break up into clusters of branchlets, and the podetial surface in the upper part develops decorticate or granular areas.

CLADONIA SQUAMOSA f. CLAVARIELLA Vainio (Notes II, p. 46). Middletown (1935), Naugatuck (1936), Warren (1935), and Winchester (1935); all except the third determined by Sandstede.

CLADONIA SQUAMOSA f. PHYLLOPODA Vainio (Notes II, p. 46). Barkhamsted (1934) and Middletown (1935, det. Sandstede).

CLADONIA SQUAMOSA f. LEVICORTICATA Sandst. m. PSEUDOCRISPATA Sandst. (p. 436). Norwich (1935).

CLADONIA SQUAMOSA f. LEVICORTICATA m. RIGIDA (Del.) Evans (p. 436). North Branford (*Muegel & Evans*, 1935).

*CLADONIA SQUAMOSA f. CARNEOPALLIDA Sandst. Abhandl. Naturw. Ver. Bremen **25**: 181. 1922. On dead moss and humus, Cedar Mountain, Hartford (*Clark*, 1933, det. Sandstede, not previously reported).

This form, which is apparently new to North America, is characterized mainly by its pale apothecia, varying in color from yellow to light reddish. The short podetia are more or less decorticate in the upper part and give off strongly fruiting branchlets.

CLADONIA DELICATA (Ehrh.) Floerke f. QUERCINA (Pers.) Vainio (p. 439). P+. Beacon Falls (*Muegel & Evans*, 1936), Branford (1936), Canaan (1936), Guilford (1936), Mansfield (1934), Naugatuck (1936), North Canaan (*Muegel*, 1936), and Thomaston (1935).

CLADONIA CAESPITICIA (Pers.) Floerke (p. 439). P+. Barkhamsted

[1] Torreya **35**: 97. 1935.

(1934), Bloomfield (1936), Clinton (1935), Glastonbury (1934), Goshen (1935), Kent (1936), Litchfield (1936), Middletown (*Muegel*, 1935), Norwich (1935), Oxford (1936), Portland (1934), Salem (1935), Stratford (1934), Thomaston (*McDonnell*, 1935), Westbrook (1935), Winchester (1935), and Woodbridge (1935).

Group Megaphyllae

Cladonia apodocarpa Robbins (p. 440). P+. Bristol (1934), Colchester (1935), Coventry (1934), Goshen (1935), Kent (1936), Naugatuck (1936, det. Sandstede), Voluntown (1935), Warren (1934), and Westbrook (1935).

Cladonia turgida (Ehrh.) Hoffm. (p. 441). P−. Canaan (1936).

Subsection Clausae

Group Podostelides

Cladonia mitrula Tuck. f. imbricatula (Nyl.) Vainio (p. 444). P+. Bristol (1934), Canaan (1936), Clinton (1935), East Haddam (1934), Guilford (1936), North Canaan (*Muegel & Evans*, 1936), Salem (1935, Stratford (1934), Winchester (1935), and Woodbury (1936).

Cladonia mitrula f. pallida Robbins (p. 445). Clinton (1935).

*Cladonia mitrula f. **epiphylloma** f. nova, apothecia parva, conglomerata, sessilia in margine thalli primarii.

On a stump in an old pasture, North Canaan (1936).

Epiphyllous forms have been described under *C. clavulifera* (p. 448), *C. subcariosa* (p. 452), and several other species of Cladonia in which the apothecia are normally borne on distinct podetia. The present form is an analogue of these. The apothecia are about as large as in f. *microcarpa* Evans (p. 446) and occur in similar crowded clusters. The Connecticut specimens are associated with f. *imbricatula* and *C. pityrea* var. *Zwackhii* f. *subacuta*.

Cladonia clavulifera Vainio f. nudicaulis Evans (p. 447). P+. Barkhamsted (1934), Beacon Falls (1936), Bloomfield (1936), Griswold (1933, listed in Notes II, p. 49, as *C. alpicola* f. *minor;* 1935, det. Sandstede), Kent (1936), Pomfret (1934), Sharon (1936), Simsbury (1936), and Woodbury (1936).

Cladonia clavulifera f. subvestita Robbins (p. 447). Barkhamsted (1934), Beacon Falls (1936), Bloomfield (1936), Branford (1936, det. H. Sandstede as *C. clavulifera*), Kent (1936), and Woodbury (1936).

Cladonia subcariosa Nyl. f. evoluta Vainio (p. 450). P−. Barkhamsted (1934), Bloomfield (1936), Colchester (1935), Guilford (1936), Kent (1936), Mansfield (1934), Salem (1935), Southington (1935), Stratford (1934), Westbrook (1935), and Woodbridge (*Muegel*, 1935).

CLADONIA SUBCARIOSA f. SQUAMULOSA Robbins (p. 451). Madison (*Muegel*, 1935) and Salem (1935).

CLADONIA SUBCARIOSA f. PLEUROCARPA Robbins (p. 451). Colchester (1935).

Group THALLOSTELIDES

CLADONIA GRACILIS (L.) Willd. var. DILATATA (Hoffm.) Vainio (p. 457). P+. Canaan (*Muegel & Evans*, 1936), Goshen (1936), and Salisbury (*Darrow & Evans*, 1935).

CLADONIA GRACILIS var. DILATATA f. SQUAMULOSA (Schaer) Sandst. (p. 458). Canaan (*Muegel & Evans*, 1936).

CLADONIA VERTICILLATA (Hoffm.) Schaer. f. EVOLUTA (Th. Fr.) Stein (p. 459). P+. Enfield (1934), Hamden (*Mrs. Hobbs & Mrs. Black*, 1934), Kent (1936), Sharon (*Green*, 1884, Underwood Herbarium, not previously listed), Winchester (1935), and Woodbury (1936).

CLADONIA VERTICILLATA f. APOTICTA (Ach.) Vainio (p. 460). Enfield (1934) and North Branford (*Muegel*, 1935).

CLADONIA MATEOCYATHA Robbins f. LEIOSCYPHA Evans (p. 462). P+. Farmington (1934) and Pomfret (1934).

CLADONIA MATEOCYATHA f. SQUAMULATA Robbins (p. 462). Farmington (1934).

CLADONIA PYXIDATA (L.) Hoffm. var. NEGLECTA (Floerke) Mass. (p. 463). P+. Bethany (*Muegel*, 1935), Canaan (1936), Goshen (*Underwood*, 1890, Underwood Herbarium, not previously reported), Griswold (1935), and Kent (1936).

CLADONIA PYXIDATA var. NEGLECTA f. SIMPLEX (Ach.) Harm. (p. 464). Barkhamsted (1934), Bethany (*Muegel*, 1935), Bloomfield (1936), Clinton (1935), Colchester (1935), Coventry (1934), Goshen (1934, 1935), Kent (1936), Mansfield (1934, det. Sandstede), Oxford (1936), Pomfret (*Mrs. Paine*, 1934, det. Sandstede), Westbrook (1935), and Woodbury (1936).

CLADONIA CHLOROPHAEA (Floerke) Spreng. (p. 465). P+. In the present series of Notes the records for *C. chlorophaea* and *C. Grayi*, together with their numerous forms, are completely revised. The following lists, therefore, will supplant those in the writer's earlier papers. Bridgewater (1928), Brookfield (*Musch & Evans*, 1927), Cheshire (1932), East Haddam (*Clark*, 1932; *Evans*, 1934), East Haven (*R. Meyrowitz*, 1922), Goshen (*L. Sudbury*, 1927), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), Killingworth (1932), Ledyard (1927), Madison (1927, 1928), Meriden (1933), Milford (1932), North Branford (1928), Simsbury (1933), Southington (1936), Stamford (*Marshall*, 1928), Suffield (*Musch & Evans*, 1930), Wilton (1931), and Wolcott (1933). The specimens upon which these records are based are indefinite as to form.

CLADONIA CHLOROPHAEA f. SIMPLEX (Hoffm.) Arn. (p. 468). Avon (1933), Barkhamsted (1933), Beacon Falls (1936), Berlin (1927), Bethany (1925, 1935), Branford (1935), Bridgewater (1928), Canaan

(1928, 1936), Canton (1933), Cheshire (1932), Chester (*Musch & Evans*, 1928), Clinton (1927, 1935), Colchester (1932), Cornwall (1928), East Haddam (1933, 1934), East Hampton (1928), Enfield (1934), Essex (1931), Goshen (1927, 1935), Greenwich (1926), Guilford (1936), Hartland (1934), Lebanon (1932), Madison (1927, 1928, 1932), Meriden (*Musch*, 1927), Middlefield (1927), Milford (1931), Monroe (1933), Morris (*L. Sudbury*, 1927), New Fairfield (*McDonnell*, 1925), New Hartford (1928), near New Haven (*Kleeberger*, 1874), Newington (*Clark*, 1933), New London (1936), Norfolk (*Nichols*, 1912; *Evans*, 1928), North Branford (*Musch & Evans*, 1927; *Evans*, 1931), North Canaan (1928), North Haven (1931), Old Lyme (1930), Pomfret (*Mrs. Paine*, 1934). Portland (1933, 1934), Prospect (1928), Putnam (1925), Salisbury (1932, 1935), Seymour (*Musch & Evans*, 1928), Sherman (1928), Southbury (1928), Southington (*Clinton & Evans*, 1927; *Evans*, 1932), Stratford (1934), Suffield (*Musch & Evans*, 1930), Thomaston (1928), Westbrook (1927), Willington (1927, 1932), Wilton (1931), and Wolcott (1933).

CLADONIA CHLOROPHAEA f. INTERMEDIA Sandst. (Notes II, p. 52). Canton (1933) and Guilford (1928).

CLADONIA CHLOROPHAEA f. COSTATA (Floerke) Arn. (p. 469). Goshen (*Underwood*, 1890, Underwood Herbarium), Morris (*L. Sudbury*, 1927), and Pomfret (*Mrs. Paine*, 1934).

CLADONIA CHLOROPHAEA f. PROLIFERA (Floerke) Vainio (p. 469). Berlin (1927).

CLADONIA CHLOROPHAEA f. PTERYGOTA (Floerke) Vainio (p. 470). Branford (1932), Canaan (1936), Cornwall (1928), North Branford (1931), and Saybrook (*Musch & Evans*, 1928).

CLADONIA CHLOROPHAEA f. CARPOPHORA (Floerke) Anders (p. 470). Berlin (1927), Branford (1928), Goshen (1935), Kent (1936), Killingworth (1932, 1933), Litchfield (1933), Simsbury (1933), Winchester (1931), and Woodbury (1936).

CLADONIA CHLOROPHAEA f. HOMODACTYLA (Wallr.) Robbins (p. 471). Madison (1927).

CLADONIA CHLOROPHAEA f. LEPIDOPHORA (Floerke) Sandst. (p. 471). East Hampton (1928), Goshen (1935), Litchfield (1936), North Branford (*Musch & Evans*, 1927), North Canaan (1928), Saybrook (*Musch & Evans*, 1928), and Southington (1927).

*CLADONIA CHLOROPHAEA f. PACHYPHYLLINA (Wallr.) Sandst. in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4^2: 421. 1931. Durham (1932), New Milford (1923), and North Branford (*Musch & Evans*, 1927).

In the writer's report, p. 472, this form is treated as a variety of *C. chlorophaea*, following the example of Vainio. Sandstede, however, gives it the subordinate rank of form.

*CLADONIA CHLOROPHAEA f. PERITHETA (Wallr.) Arn. Lich. Exsic. (Icon. Clad.) No. 1496. dextr. 1890 (as modification); Kovář, Věstnik

Klubu přírod. Prostějove **15**: 166. 1912 (as form). *Patellaria fusca* f. *pyxioides* e. m. *perithetum* Wallr. Naturg. Säulch.-Flect. 154. 1829. In a bog. Bethany (1935, det. Sandstede).

The podetia in this form give off cup-like proliferations from the outer surface.

*CLADONIA CHLOROPHAEA f. CONISTEA Del. in Harmand, Lich. France **3**: 304. 1907. On earth, sometimes over rocks, and on stumps. Barkhamsted (1934), Bristol (1934), Farmington (1934), Glastonbury (1927), Goshen (1935), Kent (1936), Litchfield (1933), near New Haven (*Livingston*, 1872), North Branford (*D. Arnold*, 1933), North Canaan (1936), Sharon (1936), Westbrook (1935), Wethersfield (*Clark*, 1933), Winchester (1935), and Woodbury (1936). Most of these records are based on Sandstede's determinations.

The writer (Notes II, p. 53) has already called attention to this interesting form and to the strong resemblance that it bears to *C. conista*. In their general morphology the podetia of these two plants, which expand gradually into goblet-like cups, are much alike. In f. *conistea*, however, the soredia are granular and the podetial cortex below the sorediose portion is more or less verruculose. In *C. conista*, on the other hand, the soredia are farinose and the podetial cortex, which consists of smooth areolae in close contact, is never verruculose.

CLADONIA GRAYI Merrill (Notes, p. 159). P—. Beacon Falls (1928), Berlin (1927), Bethany (1927), Branford (1928), Burlington (1933), Canton (1933), Clinton (1927), Darien (1926), Durham (1928), East Hampton (1928), Essex (1927), Goshen (1935), Guilford (*M. Fulford*, 1932; *Evans*, 1932, 1936), Hamden (*Mrs. Hobbs*, 1932), Hartford (*Clark*, 1933), Lisbon (1935), Litchfield (1933), Middletown (1932), North Haven (1927), Plainville (*Wright*, 1883), Stratford (1933), Torrington (1934), Union (1927), Westbrook (1927), and Wilton (1931).

The morphological distinctions between *C. chlorophaea* and *C. Grayi* are still indefinite, but an important chemical difference makes it easy to separate the species. *C. chlorophaea*, in other words, is characterized by the presence of the bitter fumarprotocetraric acid, whereas *C. Grayi* lacks this substance completely and is mild to the taste. The application of paraphenylenediamine makes this difference apparent to the sight. With *C. chlorophaea* the characteristic reddish or reddish orange color promptly appears but with *C. Grayi* the reaction is negative or nearly so. The specimens here listed under *C. Grayi* and its various forms are all negative to this reagent.

Both *C. chlorophaea* and *G. Grayi* are abundant in eastern North America and both are exceedingly variable. Under *C. chlorophaea*

...rous forms are at present recognized, although some of these are ...ected by intergradations. Under *C. Grayi* very similar forms ... be distinguished but only two of these, f. *cyathiformis* Sandst. and f. *squamulosa* Sandst., have as yet been published. In the present paper three additional forms, all of which are analagous to forms of *C. chlorophaea,* are proposed. The specimens upon which the above records are based, as in the case of the similar records under *C. chlorophaea,* are indefinite as to form.

*Cladonia Grayi f. **simplex** Robbins, f. nova, podetia simplicia, esquamulosa, sterilia, margine integro aut subintegro.

On earth, logs, and tree-bases. Barkhamsted (1928), Beacon Falls (1928, 1936), Bethany (1935), Branford (1928, 1932), Bristol (1933), Burlington (1933), Canterbury (1933), Canton (1933), Cornwall (1926), Durham (1928), East Hampton (1932), Enfield (1934), Essex (1931), Fairfield (1931), Glastonbury (*L. Sudbury,* 1927; *Evans,* 1934). Griswold (1933), Guilford (*Nichols,* 1921; *Evans,* 1925, 1928, 1932, 1935), Hamden (*Mrs. Black,* 1933), Hartland (1928), Harwinton (1933), Kent (1936), Killingworth (*Hall,* 1874; *Evans,* 1931, 1932), Litchfield (1927), Lyme (1931), Mansfield (1934), Meriden (*Musch & Nichols,* 1926), Middlefield (1932), New London (1936), North Branford (*Musch & Evans,* 1927; *Evans,* 1928, 1935), North Canaan (1928), North Haven (*Evans,* 1927, 1931; *Darrow,* 1935), Old Lyme (1927, 1930), Old Saybrook (1931), Pomfret (*Mrs. Paine,* 1934; *Evans,* 1934), Salem (1935), Shelton (1928), Somers (1934), Suffield (*Smith,* 1933), Thomaston (1933), Torrington (*Clinton,* 1928), Voluntown (1935), Westbrook (1927), and Windsor (1928).

As in the case of the analagous *C. chlorophaea* f. *simplex,* the present form may represent either a stage in the development of one of the more complex forms or a definitely arrested condition which will not develop further. The podetia, which remain sterile, are characterized by their lack of squamules and of proliferations, and the margins of the cups are either entire or vaguely and irregularly denticulate. Uniform colonies of f. *simplex* are not infrequent, but the form may occur also in association with one or more of the following forms.

Cladonia Grayi f. cyathiformis Sandst. (Notes II, p. 53). Coventry (1934) and Meriden (1927).

*Cladonia Grayi f. **prolifera** Sandst. f. nova, podetia prolifera, esquamulosa, sterilia, prolificationibus haud numerosis scyphiferis.

On earth. Guilford (*Nichols,* 1921) and Old Saybrook (1931).

In f. *prolifera,* which is the analogue of *C. chlorophaea* f. *prolifera,* the podetia agree with those of f. *simplex* in being sterile and in lacking squamules but differ in being proliferous. The proliferations arise

singly or in small numbers from the margins of the primary cups. are themselves cup-forming.

*Cladonia Grayi f. **carpophora** f. nova, podetia squamis destituta, fertilia, apothecia e margine scyphorum enata, parce aggregata, sessilia aut stipitata.

On earth and old wood. Branford (1928, 1936), Canaan (*Muegel*, 1935), Canterbury (1933), Eastford (1934), East Haddam (1927), Enfield (1934), Glastonbury (1934), Goshen (1935), Granby (*Musch & Evans*, 1930), Greenwich (1931), Griswold (*Evans*, 1933; *Snow*, 1935), Guilford (1936), Hamden (*Mrs. Black*, 1933), Hartland (1928, 1933), Killingworth (1933), Lyme (1931), Madison (1927), North Branford (1931, 1935), North Haven (*Olmsted*, 1935), Old Lyme (1927), Old Saybrook (1931), Portland (1933), Saybrook (*Musch & Evans*, 1928), Shelton (1928), Simsbury (1933, 1936), Stamford (1928), Torrington (1934), Winchester (1931), Windsor (1927), Wolcott (1933), and Woodbury (1936).

This fertile form of *C. Grayi*, in which the podetia are free from squamules, is comparable with *C. chlorophaea* f. *carpophora* but is of more frequent occurrence in Connecticut. Although the form has much in common with f. *simplex*, the large brown apothecia, which are usually produced in abundance, give the plants a strikingly different appearance. These apothecia are either sessile on the margins of the cups or borne on marginal stipes which vary greatly in length. The podetia in most cases are dark grayish green or olive-green and thus differ in color from the podetia of f. *simplex*, which tend to be pale grayish green or whitish gray.

Cladonia Grayi f. squamulosa Sandst. (Notes, p. 160). Branford (1928), Burlington (1933), Chester (*Musch & Evans*, 1928), Colchester (1932), Glastonbury (1934), Goshen, (*L. Sudbury*, 1927), Guilford (1932), Hamden (*Mrs. Hobbs*, 1932; *Mrs. Black*, 1933), Lebanon (1932), Madison (1927), Morris (1927), New Canaan (1926), New Haven (*Clinton*, 1927), New London (1936), North Branford (1935), Old Lyme (1927, 1930), Old Saybrook (1931), Shelton (1928), Simsbury (1936), Somers (1934), Stamford (1928), Thomaston (1927), Voluntown (1933), Wallingford (1931), Westbrook (1927), and Woodbridge (1935).

Under *C. chlorophaea* the sterile squamulose form is distinguished as f. *pterygota*, and two fertile squamulose forms, f. *lepidophora* and f. *pseudotrachyna*, are recognized. Under *C. Grayi*, however, f. *squamulosa* is understood in a more comprehensive sense and includes both sterile and fertile plants. Unfortunately the specimens from Burlington, which have been recorded under *C. chlorophaea* f. *pseudotrachyna* (Notes II, p. 51), give a negative reaction with paraphenylenediamine.

It has therefore been necessary to transfer them to *C. Grayi* f. *squamulosa*, as indicated above.

CLADONIA CONISTA (Ach.) Robbins f. SIMPLEX Robbins (p. 473). P+. Goshen (1935), Mansfield (1934), and Winchester (1935).

CLADONIA FIMBRIATA (L.) Fr. (p. 473). P+. Prospect (1928) and Salisbury (1928). These two specimens are listed under f. *stenoscypha* in the writer's report (p. 475). They evidently represent, however, the more typical condition of the species, since the podetia are all cup-forming.

*CLADONIA CORNUTORADIATA (Coem.) Sandst. Abhandl. Naturw. Ver. Bremen **21**: 373. 1912. *C. fimbriata* f. *cornuto-radiata* Coem. Bull. Acad. Roy. Belgique II. **19**: 40. 1865. *Cenomyce cornuto-radiata* Zopf, Flechtenstoffe 407. 1907. P+.

The choice of a name for this species is beset with many difficulties. The name *cornutoradiata* (originally written with a hyphen) was proposed by Coemans as the name of a form in 1865 and was first used in a specific sense by Zopf in 1907. Under *C. cornutoradiata*, as at present defined, two forms are included which are based on much earlier species. One of these is f. *radiata* (Schreb.) Sandst., based on *Lichen radiatus* Schreb., which dates from 1771; and the other f. *subulata* (L.) Sandst., based on *Lichen subulatus* L., which dates from 1753. According to the current rules of nomenclature the aggregate species including these two old species should retain the name of the older of the two, i.e., of the Linnaean species. This, however, would lead to further uncertainties since *Lichen subulatus* L., according to Vainio,[1] was based on at least two unrelated species. Under the circumstances it is perhaps advisable to use the name *C. cornutoradiata*, at least provisionally.

The species is exceedingly variable, and several of its more distinct forms have been well figured.[2] It agrees with most of the other members of the *C. fimbriata*-group in producing an abundance of farinose soredia and in having the sorediose areas occupy the greater part of the podetial surface. The podetia tend to be longer and more slender than in the related species and may either taper to long points or be tipped with narrow cups, which usually bear marginal proliferations. In the majority of the forms the podetia are entirely free from squamules. The distribution of *C. cornutoradiata* is still imperfectly known, but its range in North America is apparently distinctly

[1] Acta Soc. F. et Fl. Fennica **10**: 287. 1894.

[2] See Zopf, Ber. Deutsch. Bot. Gesell. **26**: *pl. 1.* 1907; Anders, Strauch- und Laubfl. Mitteleuropas *pl. 17, f. 1–3.* 1928; and Sandstede in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4[2]: *pl. 31, f. 1–7.* 1931.

northern. The plants rarely occur in extensive colonies but usually singly or in small patches in association with other Cladoniae. The following form has recently been discovered in northern Connecticut:

*CLADONIA CORNUTORADIATA f. RADIATA (Schreb.) Sandst. Abhandl. Naturw. Ver. Bremen **21**: 373. 1912. *Lichen radiatus* Schreb. Spic. Fl. Lips. 122. 1771. *Cladonia radiata* Willd. Fl. Berol. Prodr. 363. 1787. On earth, Goshen (*Clinton*, 1936, determination confirmed by Sandstede).

Among the cup-bearing forms of *C. cornutoradiata*, f. *radiata* is one of the most distinctive. It is characterized by the form of the cups, which broaden out very gradually from long stalks, and by the marginal proliferations. These are short and horn-like and extend vertically upward or nearly so. In the Connecticut material the podetial stalks are 2–3 cm. in height by 1–2 mm. in diameter, and the cups measure 4–5 mm. across. The proliferations are mostly four to eight in number and vary considerably in length.

CLADONIA NEMOXYNA (Ach.) Nyl. (p. 475). P+. Bloomfield (1936), Bristol (1934), Canaan (1936), Colchester (1935), Goshen (1935), Kent (1936), Oxford (1936), Sharon (1936), Stratford (1934), Torrington (1934), and Woodbury (1936).

The name *nemoxyna* was proposed in a subspecific sense by Acharius in 1803 but was not used in a specific sense until 1892 (see the writer's Report, p. 475). The species includes, however, two forms the names of which were used in a specific sense at much earlier dates. The first of these is f. *fibula* (Ach.) Vainio, based on *Lichen fibula* Ach., which dates from 1798; and the second is f. *Rei* (Schaer.) Anders, based on *Cladonia Rei* Schaer., which dates from 1823 (see below). The specific name *fibula* is apparently not available for the present species, since there is an older *Cladonia fibula* of Hoffmann, dating from 1796 and distinct from *Lichen fibula* Ach.; but there seem to be no valid objections to the specific name *Rei*, although Schaerer himself reduced his species to subordinate rank in 1850, under the name *C. cornuta* β. *Rei*.[1] The continued use of the name *nemoxyna*, therefore, must be regarded as more or less provisional, comparable with the use of the specific name *cornutoradiata*.

Both Anders and Sandstede state that *C. nemoxyna* is mild to the taste. The application of paraphenylenediamine, however, shows that a negative reaction is by no means constant but that the majority of the specimens which have been referred to *C. nemoxyna* give a

[1] Enum. Crit. Lich. Europ. 196. 1850.

distinctly positive reaction.[1] Sandstede, according to a recent letter, now distinguishes plants which are P+ and bitter, plants which are P+ and mild, and plants which are P− and mild. In his opinion the plants which are P+ contain the bitter fumarprotocetraric acid, although the amount in the mild specimens is too small to be detected by the taste. Such plants he retains under *C. nemoxyna* but thinks that the P− and mild plants should be separated from *C. nemoxyna* as a distinct species. This species, to which he has given a provisional name, contains no fumarprotocetraric acid. It would therefore be comparable with *C. Grayi*, which is distinguished from *C. chlorophaca* by the same chemical difference. The following records are based on P− plants, which represent Sandstede's provisional species: Cornwall (1928), Gilford (1928), Ledyard (1927), Madison (1927), and Westbrook (1927). These stations are all listed under *C. nemoxyna* in the writer's Report (p. 476).

CLADONIA NEMOXYNA f. FIBULA (Ach.) Vainio (p. 477). Branford (1936), Canaan (1936), Colchester (1935), Goshen (1934), Guilford (1935), North Canaan (*Muegel & Evans*, 1936), Torrington (1934), and Woodbury (1936).

*CLADONIA NEMOXYNA f. REI (Schaer.) Anders, Strauch.- und Laubfl. Mitteleuropas 114. 1928. *Cladonia Rei* Schaer. Lich. Helv. Spic. 34. 1823. On earth at base of boulder, Goshen (1935, det. Sandstede).

In this interesting form isidia are present among the coarse granular soredia, and the podetia are more or less squamulose, especially toward the base.

CLADONIA CONIOCRAEA (Floerke) Spreng. f. CERATODES (Floerke) Dalla Torre & Sarnth. (p. 479). P+. Canaan (1936), Clinton (1935), Colchester (1934), Goshen (1935), Kent (1936), Norwich (1935), Pomfret (*Mrs. Paine*, 1934), Salem (1935), Southington (1936), and Winchester (1935).

CLADONIA CONIOCRAEA f. TRUNCATA (Floerke) Dalla Torre & Sarnth. (p. 480). Canaan (1936), Guilford (1935), Kent (1936), Norwich (1935), Southington (1936), Warren (1935), and Winchester (1935).

CLADONIA CONIOCRAEA f. PHYLLOSTROTA (Floerke) Vainio (p. 481). Middletown (1935).

CLADONIA CONIOCRAEA f. EXPANSA (Floerke) Sandst. (Notes, p. 160). Canaan (*Muegel & Evans*, 1936, det. Sandstede), Oxford (1936), and Warren (1935, det. Sandstede).

CLADONIA CONIOCRAEA f. PYCNOTHELIZA (Nyl.) Vainio (Notes, p.

[1] See also Asahina, Acta Phytochimica 8: 53. 1934.

161). Canaan (1936), Goshen (1935), Middletown (1935). Thomaston (1935), and Warren (1935).

*CLADONIA CONIOCRAEA f. **stenoscypha** (Stuckenberg) Sandst. comb. nov. *C. fimbriata* var. *apolepta* f. *stenoscypha* Stuckenberg, Rech. Clad. Gouv. Penza et Saratow 60. *pl. 3, f. 8.* 1917. *C. fimbriata* f. *stenoscypha* Evans, Trans. Connecticut Acad. **30**:475. 1930. Canaan (1936), Goshen (1935), Hartland (1928), North Canaan (1928), North Branford (1931, not previously reported), and Winchester (1935).

At the suggestion of Dr. Sandstede (see Notes II, p. 54) the writer here transfers his *C. fimbriata* f. *stenoscypha* to *C coniocraea* and reduces it to synonymy under the new combination *C. coniocraea* f. *stenoscypha* (Stuckenberg) Sandst. Through a curious coincidence both Mrs. Stuckenberg and the writer had proposed the form-name *stenoscypha* independently for the same plant.

CLADONIA OCHROCHLORA Floerke (Notes II, p. 55). P+. Thomaston (1935).

CLADONIA BORBONICA (Del.) Nyl. f. CYLINDRICA Evans (p. 482). Pt. Bristol (1934, det. Sandstede), Clinton (1935), Coventry (1934), Farmington (1934), Goshen (1934), Kent (1936), Mansfield (1934), Oxford (1936), Pomfret (*Mrs. Paine*, 1934), Sharon (1936), Thomaston (1935), Warren (1935), and Woodbury (1936).

CLADONIA BORBONICA f. SQUAMULOSA Robbins (p. 482). Mansfield (1934).

CLADONIA PITYREA (Floerke) Fr. (p. 483). P+. Mansfield (1934), not referable to any definite form.

CLADONIA PITYREA var. ZWACKHII Vainio f. SUBACUTA Vainio (p. 485). Goshen (1935), Guilford (1936), Kent (1936), Litchfield (1936), Naugatuck (1936), Norwich (1935), and Woodbury (1936).

CLADONIA PITYREA var. ZWACKHII f. SQUAMULIFERA Vainio (p. 485). Clinton (1935), Goshen (1935), Guilford (1936), Litchfield (1936), and Thomaston (1935).

Group FOLIOSAE

CLADONIA STREPSILIS (Ach.) Vainio (p. 487). P−. Bloomfield (1936, det. Sandstede), and Canaan (*Muegel*, 1936), sterile material.

CLADONIA STREPSILIS f. GLABRATA Vainio (p. 488). Salem (1935), Southington (1935), and Warren (1934).

CLADONIA STREPSILIS f. CORALLOIDEA (Ach.) Vainio (p. 489). Branford (1936), Bristol (1934), Mansfield (1934), and Plainville (1935).

CLADONIA STREPSILIS f. SUBSESSILIS Vainio (p. 489). Sharon (1936).

CLADONIA STREPSILIS f. COMPACTA Anders (Notes, p. 163). Woodbury (1936).

Group Ochroleucae

Cladonia piedmontensis Merrill f. obconica Robbins (p. 491). P—. Salem (1935).

*Cladonia piedmontensis f. intermedia Robbins, Rhodora **31**: 104. *pl. 187, f. 8-10.* 1929. On earth in a field, Salem (1935).

In this form both large and small apothecia are present, and the podetia are either smooth throughout or squamulose toward the base.

*Cladonia piedmontensis f. phyllocoma Robbins, Rhodora **31**: 104. *pl. 187, f. 11,* 12. 1929. On earth in a field, Salem (1935).

This form agrees with the preceding in having both large and small apothecia but differs in being more or less squamulose throughout.

Cladonia piedmontensis f. lepidifera (Vainio) Robbins (p. 491). Salem (1935) and Somers (1934).

Cladonia piedmontensis f. epiphylla Robbins (Notes II, p. 57). New London (1936).

At the close of 1933 (see Notes II, p. 57) collections of Cladoniae had been made in 119 of the Connecticut towns. The explorations of the past three years have increased this number to 132, so that only 37 towns are still to be heard from. Even in the most thoroughly explored towns, however, further search ought to bring additional species and forms to light.

At the present time 46 towns can be listed in each of which 16 or more species of Cladonia have been collected. This represents an addition of 7 towns since 1933. The town still standing at the head of the list is Madison, with 37 species to its credit. Close rivals are North Branford with 35 species, Killingworth with 34, Old Saybrook with 31, and North Canaan and Goshen with 30 each. The other towns with 25 or more species each are the following: Bethany, East Hampton, Guilford, and North Haven, 29 species; Litchfield, 28; Branford, Canton, and Salisbury, 27; Barkhamsted, Beacon Falls, East Haddam, and Wallingford, 25.

The local distribution of the more common species of Cladonia was summarized in the writer's original report (p. 498). At that time *C. cristatella* stood at the head of the list with 62 towns to its credit, and *C. chlorophaea* (including *C. Grayi*) stood second with 60 towns. *C. cristatella* still stands at the head of the list but is now known from 102 towns. The species next in order are the following: *C. tenuis,* known from 87 towns; *C. bacillaris,* from 86; *C. pleurota,* from 84; *C. furcata,* from 74; *C. chlorophaea* and *C. Grayi,* from 73 each; *C. coniocraea,* from 69; *C. subcariosa,* from 61; and *C. mitrula,* from 59. Of the remaining species 22 are known from 20 or more towns each and 10 from

only 1 to 3 towns. These rarities of the Connecticut flora are *C. alpestris* (L.) Rabenh. (p. 387), *C. digitata*, *C. carassensis* Vainio (Notes II, p. 47), *C. cenotea* (Ach.) Schaer. (Notes, p. 154), *C. glauca* Floerke (p. 437), *C. alpicola* (Flot.) Vainio (Notes II, p. 48), *C. Norrlini* Vainio (p. 454), *C. decorticata* (Floerke) Spreng. (Notes, p. 158), *C. cornutoradiata*, and *C. ochrochlora*.

Osborn Botanical Laboratory, Yale University

On Pogotrichum filiforme.—This species was first collected at Helgoland by Major T. Reinbold in June, 1888 on *Laminaria*. It was described by Reinke in 1892, and figured by Dr. Kuckuck in Reinke's Atlas (Pl. 41).

The winter of 1892–'93 was of unusual severity in New England. For miles, Vineyard Sound was closely packed with jagged pieces of ice. By a search lasting much of two or three days, I found among them three depauperate specimens of a pale brown alga, about 6–8 mm. high. They were well fruited, and were identified by Dr. Farlow as *Pogotrichum filiforme*. This was subsequently reported by myself.[1]

Since that time I have found numerous specimens, always on *Zostera*, along southern New England as far west as Connecticut. After a severe storm in September, 1911, I collected a single specimen which was washed ashore along Penobscot Bay. Dr. Collins also reports it from Casco Bay, Maine.[2] It also occurs among the Faroes, and along Iceland. We thus have a rather complete chain of stations from the north Atlantic, where it seems to have been evolved.

I can not resist hazarding the guess that it is a recent migrant along our shores. The original specimens of Reinbold are dark in color, and about 50 mm. high. At first, ours were very small and pale. As time went on, they not only grew in abundance, but increased in size and became darker in color. Kuckuck found a few thalli which he thought might be sporangial; ours uniformly bore gametangia. Most of the specimens from Europe are polysiphonous; ours, without exception, are monosiphonous. I should, in this connection, note what may be an exception to this latter statement. It has frequently been suspected that this species is the *Litosiphon pusillus* of Harvey. (This is the proper form, and not *Lithosiphon* as it is commonly written.) About 1899 I collected in Narragansett Bay a scantily

[1] See Rhodora vol. 2, pp. 206 and 207. 1900.
[2] Collins, Proc. Portland Soc. Nat. History, Vol. 2, p. 270.

fruited, polysiphonous specimen which Dr. Collins, with much hesitation, called *Litosiphon*. Plainly, it was different from our *Pogotrichum*. I call attention to this problem, in the hope that some future worker may clear up this perplexing situation.—R. E. Schuh, Brooklin, Maine.

A Note on Phycological Nomenclature.—I called attention in a recent note[1] to the para-homonymy which had existed between the generic names *Coriophyllus* Rydb. and *Coriophyllum* Setch. & Gardn. until Setchell & Gardner in Univ. Calif. Publ. Bot. **16**: 341 (1927) proposed for the latter the new name *Asymmetria*. A similar case of purely orthographic variation exists between *Herpophyllum* J. Ag. and *Herpophyllon* Farlow. Here an additional source of confusion lies in the taxonomic proximity of the two genera of red algae so designated. Under Article 70, Notes 3 and 4, of the International Rules of 1935, the name *Herpophyllon* Farlow is illegitimate and must be rejected.[2] In its place I propose a new name, after Dr. Francis Drouet, American student of algae:

DROUETIA J. DeToni, nom. nov. *Herpophyllon* Farlow, Thallophyt. Galapagos Ids., p. 97 (1902); J. B. DeToni, Syllog. Alg. **4**(4): 1713 (1905), idem **6**: 598 (1924). Non *Herpophyllum* J. Ag., Anal. Algol. Cont. **2**: 62 (1894).

Drouetia **coalescens** (Farlow) J. DeToni, comb. nov. *Herpophyllon coalescens* Farlow, loc. cit. (1902); J. B. DeToni, loc. cit. (1905, 1924).—Giuseppe DeToni, Brescia, Italy.

Echinodorus tenellus, a Correction.—In reporting the occurrence of a number of plants in York County Maine,[3] *Echinodorus tenellus* (Mart.) Buchenau was included in the notes. This was based upon dried specimens from a silt-depositing estuary at South Berwick, Maine, collected in 1935, and sent to an herbarium. Since that time, an intensive search has failed to disclose a specimen of that species. A critical reexamination of recorded material shows that *Echinodorus tenellus* should be withdrawn from the flora of Maine.—Anne E. Perkins, Berwick, Maine.

[1] DeToni, G. 1935. Noterelle di nomenclatura algologica. II. Il genere *Coriophyllum* Setchell & Gardner 1917 (Floridee). Tip. Morcelliana, Brescia.

[2] My late father, Prof. J. B. DeToni, wrote concerning this name in Syllog. Alg. **6**: 598 (1924): "Nomen propter similitudinem cum alio genere, q. e. *Herpophyllum* J. Ag., forsan esset mutandum."

[3] 1936. Rhodora **38**: 452–453.

Najas gracillima in Missouri.—Dr. Fernald's discussion[1] in 1923 of the distribution of *Najas gracillima* (A. Br.) Morong revealed that the species was limited to Maine, Connecticut, Massachusetts, New York, Pennsylvania and New Jersey, and that the "customary" reports of it for Missouri were all false. But in 1936, R. T. Clausen[2] cited records to show that the range of this species had been extended by recent collectors to include Minnesota and Wisconsin; and in 1937 he reported it from Indiana and Michigan.[3]

The writer, therefore, received something of a distributional shock while collecting in Missouri during the summer of 1937. In a shallow upland pond 3½ miles south of Licking, Texas Co. in the heart of the Ozarks he collected an unfamiliar looking species of *Najas*. The pond was full of *Sagittaria rigida* Pursh and *Potamogeton diversifolius* Raf., while growing around the pond margin were *Glyceria acutiflora* Torr., *Cyperus acuminatus* Torr. & Hook. and *Scirpus validus* Vahl, not even an unusual assemblage of species. The pond, however, has now made a name for itself, because careful examination of the *Najas* material subsequently has proven it to be the rare *N. gracillima* (A. Br.) Morong, the first authentic record for Missouri. Missouri in fact becomes its southwestern limit of range known. The writer's collection of it is from an upland pond, 3½ miles south of Licking, Texas Co., Missouri, July 15, 1937, *Steyermark 23277*, and specimens may be found in Gray Herbarium, New York Botanical Garden Herbarium, Missouri Botanical Garden Herbarium, and Herbarium of the Field Museum.—Julian A. Steyermark, Field Museum of Natural History, Chicago, Illinois.

[1] Fernald, M. L. Distribution of *Najas* in northeastern America. Rhodora **25**: 109. 1923.

[2] Clausen, R. T. The Genus *Najas* in the United States. Rhodora **38**: 338 341. 1936.

[3] Clausen. *Najas gracillima* in Indiana and Michigan. Rhodora **39**: 432. 1937.

Volume 39, no. 468, including pages 465–520, and the title-page of the volume, was issued 17 December, 1937.

FEB 14 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. February, 1938. No. 470.

CONTENTS:

Taxonomic Study of Lechea. *Albion R. Hodgdon* 29

New Juncus from Utah. *Robert F. Martin* 69

Two Undescribed Plants from Arkansas. *Julian A. Steyermark* . . 71

Relation of Pinus rigida to Physiographic Features and Soil Types in Central Massachusetts. *William B. Brierly* 72

Occurrence of Poa Chaixii in America. *Olga Lakela* 73

Cyperus pilosus Vahl in the United States. *Hugh O'Neill* 74

Some Myxophyceae from Nantucket Island. *Francis Drouet* 74

Wolffiella floridana in Massachusetts. *Charles H. Blake* 76

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

H pl.459

LECHEA SAN-SABEANA: FIG. 1, fruit, capsule and dissepiments, × 8; FIG. 2, seeds, × 10; FIG. 3, TYPE-SPECIMEN, × ⅕.

L. VILLOSA, var. TYPICA: FIG. 4, fruits, × 8; FIG. 5, individual fruits and separate capsules, × 8; FIG. 6, seeds, × 10.

L. VILLOSA, var. MACROTHECA: FIG. 7, fruits, × 8; FIG. 8, seeds, × 10.

L. RACEMULOSA: FIG. 9, seeds, × 10.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. February, 1938. No. 470.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXI

A TAXONOMIC STUDY OF LECHEA

Albion R. Hodgdon

(Plates 488–491)

Linnaeus[1] had in his genus *Lechea* two species, *L. minor* and *L. major*. The type of the latter has long been known to belong to *Helianthemum*. The description of *L. minor* is generalized and that name is given in the Linnean Herbarium to specimens of several species. The specimen selected as the type by Britton[2] was the one labeled "*Capraria fol. integerrimis, fl. virg.*", this being the name given by Gronovius to one of the plants cited by Linnaeus.

Michaux[3] described three new species, two of which, *Lechea racemulosa* and *L. tenuifolia*, still stand. The other was *L. thymifolia*, the plant we now call *L. minor*. The *L. minor* of Michaux and most later authors, until Britton, included several of our northeastern species. Poiret[4] largely followed Michaux, except for the inclusion of *L. verticillata* and *L. chinensis* (two plants of the orient quite unrelated to *Lechea* as now interpreted) and the elimination of *L. minor*. Of *L. thymifolia* Michx. Poiret states, "Il est à presumer, mais sans une certitude absolue, que cette plante est le *Lechea minor* de Linné." Pursh[5] followed Linnaeus and Michaux in regard to names but, whereas the latter's *L. thymifolia* is our *L. minor*, that of Pursh is our *L.*

[1] Sp. Pl. 90 (1753).
[2] Bull. Torr. Bot. Cl. xxi. 247 (1894).
[3] Fl. Bor.-Am. i. 76, 77 (1803).
[4] Encyc. Meth. Suppl. iii. 340, 341 (1813).
[5] Fl. Am. Sept. i. 90 (1814).

maritima. This conclusion is largely arrived at through the examination of types which, in the case of the older species, have been seen by Britton.[1] The early descriptions are generally inadequate and generalized as are the early drawings. Elliott[2] gave the name *L. villosa* to the plant which had until then been called *L. major*. He pointed out the fact that the *L. major* of Linnaeus was a *Helianthemum*. The other species recognized by Elliott were *L. racemulosa*, *L. tenuifolia* and *L. thymifolia*, the last of which, by the description, is our *L. minor*. Smith[3] interpreted the Linnean *L. minor* to be the plant we call *L. villosa*. He followed Elliott in ruling out the *L. major* of Linnaeus. Otherwise he followed Michaux, except that he included the unrelated *L. verticillata*. Dunal[4] used the name *L. villosa* of Elliott in place of *L. major*. He otherwise too largely followed Michaux, except that his concept of *L. thymifolia* was partly that of Pursh. The American authors of the first half of the 19th century, except Torrey and Rafinesque, largely accepted Michaux's species and, in fact, mostly borrowed literally from his work or from that of Pursh. Torrey,[5] in 1824 recognized four species, *L. major* L., *L. minor* L., *L. racemulosa* Michx. and *L. thymifolia* Pursh.

Rafinesque's monograph of *Lechea*[6] is an interesting but entirely perplexing piece of work. In it Rafinesque first stressed the value of the length of the "external calix" in relation to the internal, also the importance of the number of seeds per capsule. The number of stamens, he believed, was still another valuable character and perhaps this view was in part responsible for the deplorable state in which he left the genus. He made three subgenera.

1. "Menandra, Fl. Virg. of Gronovius. External calix with 2 short sepals or almost lacking. Stamens 6 to 9, seeds 1 to 3. *Leaves often ternate, and flowers racemose. Perennials.*" 2. "Lechea, Ext. calix equal in length to the internal. Stamens 6 to 12, seeds 1 to 3, *flowers spicate, paniculate, some stems sterile.*" 3. "Eudiexa Raf. (well 2 external) Ext. calix longer than the internal. Stamens 3 to 6. Seeds 3 to 9. Chiefly annuals."

Rafinesque thereupon proceeded to describe 21 species (20 of them new), only four of which I have been able to correlate definitely with any known species. It is apparent that he could not discriminate in

[1] Bull. Torr. Bot. Cl. xxi. 245 (1894).
[2] Sk. Bot. S. Car. and Ga. 184 (1816).
[3] Rees's Cycl. 20 (1819).
[4] DC. Prod. i. 285 (1824).
[5] Fl. N. and Mid. St. i. 160, 161 (1824).
[6] New Fl. N. Am. i. 89–98 (1836).

value between those characters which he stated to be important and those which we know to vary with external conditions.

Spach[1] treated *Lechea villosa* as *L. Drummondii*, believing it to have been hitherto undescribed, and *L. tenuifolia* as *L. thesioides*, believing that to be a new species. Furthermore he made an entirely new genus *Lechidium* to include a remarkably distinct species from Texas, which he named *Lechidium Drummondii*.

Torrey and Gray[2] had two varieties, α and β., of their *Lechea minor*. Their concept included *L. racemulosa* Michx., *L. thymifolia* Michx. (our *L. minor* L. probably), and *L. tenuifolia* Michx. Their *L. thymifolia* is the plant we call *L. maritima*, rather than the plant to which Pursh had given the name. They made the new combination *Lechea Drummondii* of Spach's *Lechidium Drummondii*, overlooking the fact that there was already a *Lechea Drummondii* published by that author. Torrey[3] in 1843 recognized three species, *L. minor* having two named varieties 1. *dumosa*, 2. *gracilis*, which were *L. tenuifolia* and *L. racemulosa* respectively.

For a period of thirty years or more after Torrey's Flora of the State of New York appeared, there was very little published on the genus. Gray satisfied himself in the first four editions of the Manual with recognizing three species, those of Torrey & Gray's Flora excepting *Lechea Drummondii*. In 1867 we find him[4] publishing for the first time the name *L. novae-caesareae* Austin for our *L. minor* L.

In 1878 there appeared a discussion of Rafinesque's Monograph by W. H. Leggett.[5] On pages 251 and 252 he published the first lucid key that had yet appeared, making use of the better of Rafinesque's characters and stressing, in particular, the proportions of the basal leaves. Here were described *Lechea patula* and *L. cubensis* for the first time. Leggett pointed out that *L. thymifolia* of the early editions of Gray's Manual must receive another name. He also showed that the so-called *L. minor* Lam. did not properly include *L. racemulosa*, *L. tenuifolia* and *L. thymifolia* but did cover one or more previously undefined species of the northeastern United States. In all, Leggett recognized ten species and several variants which, however, he did not name. He pointed out the weaknesses and effective

[1] Hook. Comp. Bot. Mag. ii. 282–289 (1837).
[2] Fl. N. Am. i. 153, 154 (1838).
[3] Fl. N. Y. i. 78, 79 (1843).
[4] Gray's Man. ed. 5: 81 (1867).
[5] Bull. Torr. Bot. Cl. vi. 246–252 (1878).

points of Rafinesque's work and noted the difficulties involved in recognizing his species. This treatment brought Leggett recognition as the outstanding student of the genus for several years. He published little but before his death in 1882 he had gone over with Britton[1] Rafinesque's study on the group and had given tentative names to many new species.

Gray's (or perhaps Watson's)[2] views on the species within the manual-range appeared in 1890. Here were included *Lechea major*, *L. tenuifolia*, *L. racemulosa*, *L. minor* and *L. minor* var. *maritima*.

Chapman[3] published *Lechea cinerea* Raf. and *L. cinerea* var. *Torreyi*, one of the first of the complexes of a species and its variety to be satisfactorily treated. It was with Leggett's work as a basis that Britton[4] in 1894 published his monograph, the most penetrating piece of work to appear on the genus. The following species were here described for the first time but were attributed to Leggett, *L. intermedia*, *L. Torreyi*, *L. stricta* and *L. divaricata*. The new combination *L. tripetala* (Moc. & Sess.) Britton was made. The name *L. maritima* for *L. thymifolia* Pursh was established and the species *L. Leggettii* was given clear delineation. Altogether fourteen species were described but no varieties were recognized.

Robinson's treatment,[5] generally speaking, was a scholarly piece of work but technically based largely on Britton's monograph, as is stated in a footnote.[6] It included only the species of the United States and Canada (11 in all) and consequently omitted *Lechea cubensis* and *L. tripetala*. Chiefly on the basis of type of pubescence he chose, following Gray, to make the very distinct *L. divaricata* a variety of *L. villosa*. Unlike Britton, he retained the subgenus *Lechidium*.

Bicknell[7] described *Lechea juniperina* from the coast of Maine. This was included in the treatment of the genus by Britton and Brown.[8] In the latter work are descriptions of nine species accompanied by figures showing the panicles, basal shoots, capsules and calyces. The illustrations in common with all those of the genus

[1] Bull. Torr. Bot. Cl. xxi. 245 (1894).
[2] Gray, Man. ed. 6: 77, 78 (1890).
[3] Fl. S. U. S. ed. 2, Suppl. 2: 678 (1892).
[4] Bull. Torr. Bot. Cl. xxi. 244–253 (1894).
[5] Syn. Fl. N. Am. i[1] 192–194 (1895).
[6] Syn Fl. N. Am. l. c., 192 (1895).
[7] Bull. Torr. Bot. Cl. xxiv. 88 (1897).
[8] Ill. Fl. ed. 1, ii. 441–444 (1897).

except in Gray's Genera[1] are crude and frequently inexact. The basal leaves of *L. intermedia* in Britton & Brown are shown to be as broad proportionally as those of *L. maritima*, whereas, in the description they are given as 4″–5″ long, ½″ wide for the former and 3″–4″ long, 1½″–2″ wide for the latter. Actually they are of about equal proportions in both and more than three times as long as broad and not, as stated in the key for *L. maritima*, "Leaves of the basal shoots oblong or ovate, not more than three times as long as broad." Britton's latest exposition of the genus,[2] in 1901, was largely that of his earlier works except for the inclusion of Bicknell's *L. moniliformis*, published for the first time.

The most recent work on *Lechea* in its entirety is that of Grosser.[3] It has more complete citations of specimens and literature than any previous work. The author retains the name *L. major* for *L. villosa* and makes of it two varieties, var. α. *villosa* and var. β. *divaricata*. He maintains *Lechidium* as a section and includes in it the species *L. san-sabeana*. There are thirteen species taken up in this work.

Small[4] included *Lechea maritima* among the ten species recognized within the range of his Flora; but as far as I have found it does not occur south of Virginia. The very distinct *L. Drummondii* was not placed in a separate subsection or subgenus. Generally speaking his treatment of 1903 was sane and conservative.

Robinson and Fernald[5] maintain eight species in the manual-range. *Lechea juniperina* is reduced by Robinson to the status of a variety and *L. moniliformis* is cited as a synonym of *L. Leggettii*. Robinson describes *L. maritima* var. *interior* which tends to confuse rather than clarify that particular complex.

Small's recent treatment[6] is a very radical piece of work. In the first place, of the fourteen species there appearing five are of his own making. These are *Lechea cernua*, *L. exserta*, *L. myriophylla*, *L. prismatica* and *L. Deckertii*, the first and last named of which were published earlier and are satisfactory species. The three remaining were there described for the first time. *L. prismatica* and *L. exserta* I include with *L. patula*, *L. myriophylla* with *L. Deckertii*. Small makes five sections: I. *Longisepalae*, with five species; II. *Brevisepalae*,

[1] Genera Ill. i. 205, 206, pls. 88 and 89 (1848).
[2] Man. ed. 1: 631–633 (1901).
[3] Engler, Pflanzenr. iv[193]. 133–140 (1903).
[4] Fl. Se. U. S. 798, 799 (1903).
[5] Gray's Man. ed. 7: 577–579 (1908).
[6] Man. 881–884 (1933).

with four species; III. *Cernuae*, with one species; IV. *Divaricatae*, with one species; V. *Myriophyllae*, with two species. *L. prismatica* is placed by Small in the *Longisepalae*, *L. exserta* in the *Brevisepalae;* yet, I consider both of these forms of *L. patula* which he places in the *Longisepalae*. In his work no varieties are recognized.

Plants of *Lechea* are generally perennial but they are frequently biennial in the northern United States and in Canada or they may fruit on abbreviated stems at the end of the first season. In the South, generally, the plants are strongly perennial to suffruticose. The same species, *L. villosa* var. *typica* for example, may in the North be biennial, with a virtually unbranched caudex, and in the South become strongly perennial, with a greatly branched caudex. Generally speaking, however, the suffruticose habit is confined to several very distinct subtropical species and the biennial nature appears where winters are severe.

The ROOTS offer no characters of importance. They are very crooked, with short stout branches and are essentially similar throughout the genus.

The BASAL SHOOTS are of particular interest and importance. They are called by Britton[1] "sterile radical shoots"; Grosser[2] calls them "rami steriles basales." They have been spoken of mostly as basal shoots and I shall so call them in this paper. In the suffruticose species, *Lechea Deckertii, L. tripetala* and *L. cubensis*, they are wanting. The new shoots appear sporadically as branches in such cases. *L. patula, L. divaricata* and *L. villosa* in the southern part of their ranges all have an extensive branching caudex. In the season of vegetative development the new shoots appear from any part of the caudex but frequently from towards its base. Except that they undergo no rest-period they are quite comparable to the basal shoots of the northern species, which branch from all sides of the contracted caudex, forming a rosette. They develop from late in August until late in November, the time of appearance depending in part on the species and partly on the maturity of individuals. Basal shoots persist for many months at a certain stage of development which appears to be definite for each species. They offer one of the most certain means of identifying the species in which they undergo a definite period of dormancy.

The BASAL LEAVES (the leaves of the basal shoots) are crowded and

[1] Bull. Torr. Bot. Cl. xxi. 246 (1894).
[2] Engler, Pflanzenr. iv[193]. 137 (1903).

strongly reduced in size. In quality and quantity of pubescence they are similar to the very mature cauline leaves. The basal leaves are more reduced in length than in breadth, making them proportionately broader than the cauline. Generally they are simple but in *Lechea villosa* var. *typica* and in *L. tenuifolia* (particularly in the latter) they are branched.

The FRUITING STEM results either from the renewed growth of the simple basal shoots or from one of its branches, when they occur. The transition from basal shoots to fruiting stems is abrupt in the North except in one or two instances, notably *Lechea intermedia* var. *depauperata* of the Lake Athabasca region, which is growing in a climate so much more severe than ours that comparison of its manner of growth with that of our species is difficult. In the broad-leaved species (comparatively speaking) of Florida we find the most complicated series of growth-stages. The new branches may be from the base or above, on the caudex, and may or may not have undergone dormancy; but in either instance they are related morphologically to basal shoots. *L. patula* illustrates the complexity of growth. The dormant shoots are frequently simple and have small narrowly elliptic-oblong leaves. During development which, in suffruticose types such as this, is very slow, the shoots become much branched and bear much larger leaves but otherwise simulate the resting condition. The mature fruiting stems have a still different type of leaf, narrower and less densely pilose.

The PUBESCENCE in the genus is all of one kind. Solereder[1] describes the peculiar falsely bicellular hair which he states is well known also in the *Combretaceae*. Kearney[2] figures a hair of this nature from *Lechea maritima*. It is presumably the only kind that he observed since he describes this type as characteristic and mentions no other. In my own observations on the genus I have seen no stellate or glandular hairs nor in fact any but a uniform type. Janchen[3] states that the "Deckhaare" are "einfach." Kearney, l. c. p. 498, describes three types of hairs for *Helianthemum*, the type mentioned above as well as stellate, pluricellular and multicellular, glandular hairs. Of *Hudsonia*, however, Kearney, l. c., referring to the peculiar hairs of *Lechea*, states, "Hairs similar to those just described form the dense covering of the leaves of *Hudsonia tomentosa*.

[1] System. Anat. 91 (1899).
[2] Contrib. U. S. Nat Herb. (Bot. Dismal Swamp Region, 497) v. 497 (1901).
[3] Engler & Prantl, Nat. Pflanzenfam. ii[21]. 301 (1925).

The DISPOSITION OF THE PUBESCENCE, particularly on the leaves, is rather complicated and of considerable value taxonomically. The species *Lechea cernua* and *L. villosa* display the greatest extent of pilosity. All leaves of the former are strongly pilose to tomentose above and below. *L. villosa* var. *Schaffneri* from Mexico is likewise strongly pilose on both leaf-surfaces. The southern subshrubby plants of *L. villosa* var. *typica* also bear leaves which are strongly pilose above. The upper surfaces of leaves of northern *L. villosa* var. *typica* are usually only slightly pilose. In this species the basal shoots, when well developed, bear leaves which are glabrous above. When hairs occur on the upper surface they are scattered over the entire surface. On the lower surface they may be distributed generally but in such cases are more concentrated on the midrib and the margin. In the larger number of species they are confined to the midrib and the margin. *L. villosa* and to a less extent *L. maritima* display most of the degrees of pubescence during their development.

The QUALITY OF PUBESCENCE varies somewhat. The hairs are short and decidedly appressed in *Lechea intermedia;* they are long and spreading in *L. villosa.* Various intermediate types occur between the two. Buds, young shoots and branches are always strongly or densely pilose or tomentose to villous.

The SIZE OF THE PLANT differs considerably in the various species and varieties. *Lechea intermedia* var. *depauperata* has semiprostrate fruiting stems a few cm. long. *L. Leggettii* var. *ramosissima* may be 80 or more cm. in height. The branches may be broadly, at times horizontally spreading, forming a loose globose panicle, as in the last named variety, or suberect and contracted into a dense spire-shaped panicle, as in *L. stricta.* In general the shape of the panicle may vary considerably within certain limits.

The ARRANGEMENT OF THE FRUITS is a fairly definite character for each species or variety. *Lechea villosa* var. *typica,* for example, has fruits in crowded heads. The pedicels, which are short, are appressed to strongly spreading or reflexed in relation to the axis, in this way allowing a maximum amount of concentration on the short fruiting branches. The disposition of the fruits undergoes considerable modification within species in different geographic areas. Thus, the northeastern and inland *L. Leggettii* var. *typica* usually has the fruits definitely crowded at the top of the fruiting branches. Var. *moniliformis* of the northern Coastal Plain and the Great Lakes region has

them predominantly evenly distributed, or nearly so, on much longer branches; while var. *ramosissima* of the southern Coastal Plain has them evenly distributed but scattered on very long fruiting branches. *L. Torreyi* has the fruits racemose and mostly evenly distributed on but slightly crooked branches, whereas var. *congesta* has short and very crooked fruiting branches which bear the fruits in close racemes or clusters. At least two special examples of fruit-arrangement are worthy of brief mention here. *L. cernua* has the fruits in clusters of a few each. They are not crowded but, nevertheless, are appressed, spreading or reflexed upon the axis in a peculiar manner certainly suggesting the position of the pedicels in the crowded clusters of *L. villosa* for example. *L. san-sabeana* of the subgenus *Lechidium* has its fruits strongly secund and widely scattered on the very long branches and borne at right angles to the axis on very long pedicels.

The FRUITS offer the best characters for taxonomic study. The slight differences, however, in shape and size of calyx-parts, capsules and seeds make it difficult for one to describe distinctions which actually exist and are, furthermore, very apparent to a student of the genus. The differences are slight, not only between species and varieties but between true species and also between groups of species. For example: a rather fundamental character in the genus is the shape of the calyx, whether it is broader toward the base than above or whether it is broader toward the tip or above the middle and narrows in one way or other toward the base. Four species, which in other respects have striking similarities, have the calyx distinctly broadest below the middle and toward the base. These are *Lechea san-sabeana, L. tenuifolia, L. mensalis* and *L. tripetala.* The calyces of the other species, while broadly globose at times, have an obconic base merging into the pedicel. Generally these species have pyriform or cuneate-obovoid to cuneate-globose fruits.

The CALYX is composed of five sepals in two very dissimilar series, an outer two which are bracteole-like and an inner three constituting the prominent calyx. That the outer two are sepals and not bracteoles is stated by Grosser[1] "Die beiden äusseren . . . sind von manchen Autoren als Vorblätter gedeutet worden, eine Ansicht, deren Richtigkeit stark in Zweifel gestellt wird einerseits durch das Vorhandensein eigentlicher Vorblätter, andrerseits durch die bisweilen mächtige Entwickelung der äusseren Kelchblätter, wie bei

[1] Engler, Pflanzenr. iv[193]. 5 (1903).

einigen Arten von *Cistus* und *Tuberaria*, wodurch sich dieselben als echte Bestandteile des Kelches zu erkennen geben." Much the same interpretation is given by Janchen[1] more recently in his discussion of the group. In *Lechea* the outer sepals are always much narrower but may be either longer or shorter than the inner. Usually the outer are greener and more leaf-like than the inner. In the narrow-leaved species with long exterior sepals, *L. san-sabeana* and *L. tenuifolia* for example, the small upper cauline leaves strikingly resemble these structures. The four species of *Lechea* which have calyces broadest near the base also have exterior sepals equaling to considerably exceeding the inner. The remaining species, except *L. patula*, *L. villosa* and *L. minor*, which possess relatively broad leaves in addition to long exterior sepals, have these from minute and hardly obvious to slightly shorter than the inner.

The CAPSULES are broadly ovoid and broadest toward the base in *Lechea tenuifolia* and its relatives (mentioned above), thus conforming to the shape of the calyx. The capsule is usually about equal to or slightly exceeded by the calyx but in three species, *L. divaricata*, *L. Deckertii* and *L. patula*, the capsule is much longer than the calyx. The first two have globose capsules; *L. patula* has them narrowly ovoid. A characteristic of several species is the fact that the three valves are somewhat or completely united. In the majority of species, the valves in maturity become separate to the base and hence are easily removed. The valves of *L. cernua* are united about to the middle. Those of *L. divaricata* and *L. Deckertii* are entirely grown together. The first two species have the wall of the capsule indurated; in the last named the wall is papery. The placentae and dissepiments, which in several species tend to become prominent, in *L. san-sabeana* become permanent structures in the capsule.

The SEEDS are of diverse form and number. For each species or variety they are fairly constant in shape, size and number per capsule. Depending on the number in the capsule, they are equilateral and dorsi-ventrally compressed if 2; irregularly ovoid if 1; of various shapes if 3; and 3-sided and tending to be equilateral, with two nearly flat subequal faces meeting in a sharp keel, when the number is 4 to 6. The shape of capsule characteristic of certain species determines to a lesser extent the form of the seeds. There are several species each having 1, 2, 3 and 4–6 seeds. The chief value of the seed-char-

[1] Engler & Prantl, Nat. Pflanzenfam. ii[21]. 295 (1925).

acters rests upon the fact that some species, which are otherwise difficult to separate, are easily distinguishable by their seed-differences. The seeds of several species are marked by certain peculiarities. *Lechea intermedia* has the mature seeds with a delicate covering which adheres in places resulting in a reticulate surface. Two other species, *L. divaricata* and *L. cernua*, have in maturity a non-reticulate membranaceous coat. *L. villosa* has very lustrous seeds possessing an almost transparent endosperm, thus allowing the embryo to be conspicuous. *L. tenuifolia* and *L. maritima* have light- to medium-brown dull (non-lustrous) seeds wherein the embryo may easily be noted. The remaining species have mostly dark-brown seeds with the embryo not apparent.

The FLOWERS of *Lechea* are of very minor value in classification. The flowering of *L. maritima* was considered by Leggett[1] so unusual that he specially mentioned the phenomenon. Britton[2] states "All the Lecheas which I have been able to examine in the field bloom very shyly and the whole plant appears to come into flower at the same time. This occurs in bright sunshine, the petals are fugacious and thus the flowers are of but little practical value in classification." I have studied the two common species, *L. intermedia* and *L. maritima*, intensively in the field during the summer and autumn but I have never seen either with fully expanded flowers. The scattered specimens in flower from the several herbaria represented in this study show that in some species the number of stamens (the floral organs most likely to yield diagnostic characters) in the flowers, even on the same plant, is very variable. *L. divaricata* has from 15 to 25 (perhaps more). *L. patula*, on the contrary, has an average of perhaps 6. *L. intermedia* has from 12 to 17. Other species are equally variable in the number of stamens and greatly overlap, indicating that this character has but little diagnostic value.

Kearney[3] states that *Lechea maritima* may be "safely referred to" as being self-fertilized. If the amount of seeming hybridization between species is an indication of the nature of pollination, *L. maritima* must certainly be to a considerable extent cross-fertilized in one way or another. I have seen probable hybrids of *L. maritima* and *L. minor* from Nantucket and Chappaquiddick Islands collected by Bicknell. *L. villosa* rather frequently hybridizes with *L. maritima*.

[1] Bull. Torr. Bot. Cl. viii. 116 (1881).
[2] Bull. Torr. Bot. Cl. xxi. 246 (1894).
[3] Contrib. U. S. Nat. Herb. (Bot. Dismal Swamp Region) v. 393 (1901).

Bicknell had a specimen from Chappaquiddick Island and Mrs. C. M. Carr has collected it in Sudbury, Massachusetts. In Concord, Massachusetts, during the autumn of 1934, I saw numerous intermediates between *L. villosa* and *L. maritima* growing with these species at the edge of a field. Besides these pronounced probable hybrids, I have seen dried specimens of similar character between *L. maritima* and *L. Leggettii* and between *L. maritima* and *L. intermedia*. They are frequently difficult to detect because of the close resemblance of the parents.

The genus *Lechea* is the most distinctive of the several genera in the *Cistaceae*. Hutchinson,[1] in his description of the family, states the characters (several of which are not found in *Lechea*): "Herbs or shrubs, often with *stellate* indumentum; leaves *opposite* or rarely alternate, simple; stipules present or adnate to the petiole; flowers ☿ actinomorphic, solitary to cymose, showy; sepals 3–5, *contorted;* petals 5 to 0, *contorted*, very soon falling off; stamens *numerous*, hypogynous; . . . style simple with 3–5 free or united stigmas; . . . seeds with endosperm and bent, coiled or folded embryo." Grosser[2] in his key to the *Cistaceae* correctly separates *Lechea* from the remainder of the family by attributing to it "Petala 3, persistentia. Aestivatio imbricata." The hairs are simple and falsely bicellular, not stellate (see discussion above). The leaves are alternate, without visible signs of stipules. The flowers are minute and about as conspicuous as those of a *Juncus*, though much more rarely seen. The sepals are 5 and are scarcely, or not at all, contorted. The petals are 3 and, as correctly stated by Grosser, imbricated and persistent. The stamens are in perhaps half of the species less than 8 or 10. The stigma is entirely sessile and strikingly plumose, thus differing from most members of the family, in which it is discoid or hemispherical. Of the three North American genera of the *Cistaceae*, *Lechea* is farthest removed from the more typical Old World genera.

What I believe to be the true relationship of most of the species follows in general the principal headings within the key. *Lechea san-sabeana*, distinct enough to warrant its being placed in the subgenus *Lechidium*, is most closely related to the narrow-leaved *L. tenuifolia* and *L. tripetala*. These, in turn, appear to be nearer the broad-leaved *L. villosa* and only remotely connected with the narrow-

[1] Fam. of Fl. Pl. Dicotyledons, 162, 163 (1926).
[2] Engler, Pflanzenr. iv[193]. 10 (1903).

leaved southeastern Lecheas. The change from broad to narrow leaves is surely less fundamental than differences in reproductive structures. There is no evidence to show, however, that *L. tenuifolia* or any other narrow-leaved species ever tends to produce any but narrow leaves in whatever climate it grows. *L. villosa* var. *Schaffneri*, on the other hand, of semi-arid mountains of Mexico is distinguished from the broad-leaved var. *typica* of the more northern and less arid habitats by its much narrower leaves. In general it appears that a species like *L. villosa* (var. *typica*) with broad leaves, which have hairs both above and below, with basal leaves much like the cauline or perhaps lacking, with fairly prominent exterior sepals and several seeds (3 or more) represents a type from which most of the other species might have been derived. Beyond saying that the eastern species, *L. minor*, *L. racemulosa*, *L. patula*, *L. Leggettii* and *L. Torreyi* are definitely related, I hesitate to say more of relationship for want of definite facts.

Geographical Distribution

The *Cistaceae* as a family are found in North and South America, Europe, western Asia and northern Africa. There are but few species in Asia and South America. The strongest concentration of species is in the Iberian Peninsula and in that part of North America known as the Atlantic Coastal Plain, a range which may well indicate a considerable antiquity for the family as a whole. Fernald,[1] in speaking of areas having distinct and restricted floras, states "Again, can it be that the antiquity of the Iberian tableland, essentially undisturbed since the dawn of angiosperms, has nothing to do with the occurrence there of 800 endemics?" Many characteristic elements in the flora of the Coastal Plain have been shown to be ancient, because of their close relationships only with groups in remote parts of the world.

The facts that *Hudsonia* and *Lechea* are very distinct from the European genera of the family and that our third genus, although long referred to *Helianthemum*, is so different from the European and typical species of that genus that some recent authors, Britton,[2] Janchen[3] and Small,[4] regard it as generically distinct, demonstrate that the period when the family was connected in some manner between the two areas was remote.

[1] Quarterly Review of Biol. i. 233 (1926).
[2] Britton & Brown, Ill. Fl. ed. 2, ii. 539 (1913).
[3] Engler & Prantl, Nat. Pflanzenfam. ii[21]. 305 (1925).
[4] Small, Man. 878 (1933).

Confining our attentions to *Lechea*, we may note several interesting points in its distribution:

1. The occurrence in Florida, Cuba and Texas of five species having definitely localized range. Two, *Lechea cernua* and *L. divaricata*, are confined to central Florida; two others, *L. san-sabeana* and *L. mensalis*, are confined to Texas, the former to the eastern half of the state, the latter to a single station in the Chisos Mountains, where many local endemics occur; one, *L. cubensis*, is known only from a single locality in the western part of Cuba. Furthermore, two more species are in part or chiefly confined to Florida, *L. Torreyi* var. *typica*, which is restricted to that state, and *L. Deckertii* which, except for one station in southern Georgia, does not get out of its confines. In distribution, as in morphological structure which has been discussed for most of the species, the highly localized species may be considered to be in a stage of maturity or old age. It is a rather striking contradiction of the Age and Area hypothesis of Willis that the above named very specialized species, which are so distinct that in several instances their kinship in the genus is only to be guessed at, have strikingly restricted ranges.

2. The obvious sharing of range of several species between the Coastal Plain and the Appalachian Upland. Fernald[1] has discussed this relationship rather completely in his paper "*Specific Segregation and Identities in some Floras of eastern North America and the Old World.*" The conclusion seems to be tenable that the groups which are characteristic of the present youthful Coastal Plain but in major part are very old, persisted during the vicissitudes of the Tertiary on the very ancient area of the Appalachian Upland. *Lechea minor* and *L. racemulosa*, which are stable and very distinct species, are strikingly common on the Coastal Plain and likewise abundant in the mountains, *L. minor* in western North Carolina, eastern Tennessee and eastern Kentucky, *L. racemulosa* along the whole Appalachian axis from Pennsylvania south to northern Alabama and Georgia. One other species, *L. intermedia*, which is found on at least one of the Appalachian Mountains in Virginia (Elliott's Knob), is not abundant on the Coastal Plain. It is the dominant species of the genus, however, in most of glaciated eastern North America. This may indicate the source of some of our eastern species which are now characteristic of glaciated areas.

[1] Rhodora, xxxiii. 25–63 (1931).

3. The presence of several species in the region of Lake Michigan and Lake Erie. *Lechea minor* and *L. racemulosa*, in addition to their disrupted occurrences on the Coastal Plain and the Appalachian Upland, exhibit still another break in range by their presence about the Great Lakes. In this region, *L. racemulosa* is found only at the southern end of Lake Michigan in Indiana, while *L. minor* is found in Indiana, Michigan, Ohio and in southwestern Ontario. Except for the occurrence in Michigan the stations are all near Lake Michigan or Lake Erie. *L. Leggettii* var. *moniliformis*, the variety of *L. Leggettii* which is found on the Coastal Plain from Delaware north to Massachusetts, is also isolated in northwestern Indiana and northern Ohio. Otherwise it is absent from the interior of the continent. *L. villosa* var. *typica*, also of the Coastal Plain, is abundant in the states bordering the southern end of Lake Michigan as well as in Ohio and southern Ontario, but in these instances it is found only near the lakes or across northern Indiana and southern Michigan and is otherwise nearly absent. A comparison between the ranges of *L. tenuifolia* and of *L. villosa* var. *typica* may be of interest. In New England their ranges are somewhat similar except that *L. villosa* var. *typica* is much more a plant of the Coastal Plain. In the southern part of its range *L. tenuifolia* pushes farther into the interior. In the Mississippi Valley and in eastern Texas the ranges nearly coincide, except that, in the region of the Ohio River and in the area of the upper Mississippi, *L. tenuifolia* has proceeded farthest. Near the Great Lakes, however, *L. tenuifolia* is entirely wanting, whereas *L. villosa* var. *typica* is very abundant. The presence of *L. tenuifolia* in southern Maine and eastern Minnesota (north of the Driftless Area) attests to its hardiness, and its presence in much of southern New England proves its capacity for migration. There is no evidence to show that *L. villosa* var. *typica* is in any way more adaptable than is *L. tenuifolia*. The chief factor in the distributions appears to be this. One species, *L. villosa* var. *typica*, is a plant mostly of the Coastal Plain; *L. tenuifolia* is not. Plants of Coastal Plain range, for some reason as yet unsatisfactorily explained, are often abundant in the area at the southern end of Lake Michigan and to a lesser extent near the shores of Lake Erie.

I shall review some of the theories treating the origin of this interesting disruption of range. Peattie,[1] discussing the inland occurrence of Coastal Plain plants, states "In the flora of the Lake Michigan

[1] Rhodora, xxiv. 59 (1922).

area, at least, there are two general types of inland extension from the Coastal plain. The first type is the very discontinuous range. . . About one third of all the Coastal plain species of this area show a roughly similar range with, perhaps, one additional station in New York State or on one of the other Great Lakes."

Later Peattie mentions *Euphorbia polygonifolia:* "This little plant of the sea strands [rather of dune-hollows] also occurs in a general way around the Great Lakes. . . . The majority of coastal plain species show a similar range." Peattie concludes that all of the species of the Coastal Plain which are found in the Great Lake area achieved their present limits in post-glacial time, their route of migration being along the Hudson-Mohawk Valley and the Lake Ontario Basin, thence along the margin of Lake Algonquin and through the Grand River Valley of what is now Michigan, finally to arrive at the southern end of Lake Michigan. Some lingered only in this very favorable spot. Others persisted in scattered favorable areas along the way.

It is quite possible that the species of *Lechea* migrated over such a route to arrive finally near Chicago. Their abundance on Long Island and in New Jersey shows this to have been possible. The utter lack of *L. minor*, however, along most of the postulated route of migration, and the fact that one-third of all the Coastal Plain species in northern Indiana have the extreme type of disruption revealed by *L. racemulosa*, which is absent from the entire hypothetical route, make it appear quite probable that considerable geologic change has taken place to bring about this disrupted range, more, in fact, than has occurred since the last of the several minor advances of the Wisconsin ice.

W. T. McLaughlin,[1] discussing the occurrence of Coastal Plain plants in northwestern Wisconsin and speaking of the recession of Wisconsin ice and the formation of Glacial Lake Duluth, writes, "It was, presumably, during this interval, while the ice was retreating northward and before the readvance, that the forest developed at Two Creeks, Manitowoc County." (The forest was mentioned earlier by him, l. c. p. 360.) If forests could develop "when the ice had retreated somewhat to the northward" and before a minor advance, is it not evident that the climate in the vicinity of the Driftless Area and Lake Michigan was, during much of the Wisconsin, suitable for vegetative development? McLaughlin[2] suggests that the Coastal

[1] Ecological Monog. ii. 360, 361 (1932).
[2] Ecological Monog. ii. 361 (1932).

Plain plants became established in the Chicago region during the time of this minor oscillation of ice. May it not be as accurate to say that this localized Coastal Plain flora, one-third with a broad disruption in range, is a relic-flora, the result of a pre-Wisconsin dispersal, as to attempt to account for it by a hypothetical path of migration in combination with a highly improbable late glacial or post-glacial destruction of all evidence of migration?

To explain the highly relict flora of Keweenaw County Fernald[1] states "The high bluffs of Keweenaw evidently were not denuded by Wisconsin ice and, consequently, they served as centers on which many species survived." Fassett[2] explains the existing relict flora confined to the Driftless Area as being "fairly interpreted on the basis of lack of glaciation in southwestern Wisconsin" but he considers it impossible that the Driftless Area should have housed any species of the Keweenaw Area. With the Wisconsin Glaciation becoming revealed as a series of separate phases of local origin, with distinct nunataks here and there which were never overrun, it seems to me that some part of the region at the southern end of Lake Michigan, with its highly localized flora of Coastal Plain species, may well have served as a haven throughout the Wisconsin.

I will here mention several other considerable disruptions of range. The station at Belleville near the northern shore of Lake Ontario, marks an extension of range of *Lechea stricta* from the southern end of Lake Michigan. This may mean that recent migration around the Great Lakes has been in part at least in an easterly direction, in this instance from the region in and about the Driftless Area and from the area about the southern end of Lake Michigan. It should be noted, however, that the region of Belleville has long been known for its remarkably isolated stations for western species, such, for instance, as *Myosurus Shortii* Raf., a typical prairie plant with a broad range from southwestern Indiana and western Kentucky and Tennessee to Texas and Manitoba, and *Collinsia parviflora* Lindl., with general cordilleran range but isolated eastward at remote points (Keweenaw Peninsula, Michigan, north shore of Lake Ontario, and a single mountain-slope in western Vermont). *Lechea stricta* may, consequently, prove to be a pre-Wisconsin relic at its easternmost station.

The occurrence of *Lechea Torreyi* var. *congesta* in British Honduras more than eight hundred miles from the nearest station near Miami,

[1] Rhodora, xxxvii. 216 (1935).
[2] Rhodora, xxxiii. 226–228 (1931).

Florida, is one which I will not attempt to explain nor can I account for the presence in northern Oklahoma of *L. tripetala*, which otherwise is confined to areas at high elevations in Mexico, unless it be in Oklahoma a relic from a very ancient dispersal. Its southernmost station, in Guatemala, is likewise on an ancient core, as ancient as the Ozark Upland.

Material Examined

In the course of my work on this genus I have made extensive use of borrowed material and in addition I have visited the herbarium of the Philadelphia Academy of Sciences and that of the New York Botanical Garden. I have thereby been enabled to see representative material from the entire range of the genus as well as the principal type-material in American herbaria. The institutions from which I have seen specimens are listed below.

Amherst College (Amherst)
Brooklyn Botanical Garden (Brooklyn)
Field Museum (Field)
Gray Herbarium
Missouri Botanical Garden (Mo)
New England Botanical Club
New York Botanical Garden (NY)
Philadelphia Academy of Sciences (Phila)
United States National Herbarium (US)

Following the name of each of the above institutions is appended the abbreviation which I have used in this work to indicate the location of cited material. That from the Gray Herbarium and the herbarium of the New England Botanical Club, I have not specially indicated, except in the case of types. When, as frequently happened, a collection is found in several herbaria, I have cited only the one from which the specimen was distributed, if this is known.

I wish to express my appreciation to those who very generously lent me their collections for study and I appreciate the warm hospitality extended to me at the institutions which I visited. I particularly thank Professor M. L. Fernald, who, throughout the work, has given me invaluable suggestions and guidance; Mr. C. A. Weatherby for his kind assistance in various ways; Dr. Lily M. Perry for many kindly services in putting the paper into final form; and Mr. E. C. Ogden for his aid in the preparation of the photographs. Although the maps are from a plate owned privately by Professor Fernald and intended for his own use, he has very generously permitted me the use of them in this particular study which was, of course, carried on under his supervision.

Synoptic Treatment of Genus

Lechea L.[1] Perennials, suffruticose to herbaceous, subprocumbent to erect, mostly strongly branched: leaves alternate to falsely verticillate, ovate to narrowly lanceolate, or even subulate: flowers small (2–4 mm. broad), numerous; sepals 5, in two distinct series, the 2 outer narrowly lanceolate to narrowly linear or subulate, frequently inconspicuous, the 3 inner imbricated in the bud, ovate to obovate, from shorter than to greatly exceeding the outer; petals 3, dark red, mostly shorter than the sepals, imbricated, plane in the bud, after flowering very quickly withering, marcescent; stamens 3–25 (mostly 5 or 6–15): ovary short-stipitate: style very short or lacking: stigmas 3, dark-red, fimbriate-plumose: placentae 3, broad and valve-like, each bearing (primitively) a pair of erect subsessile ovules, one on each side of the posterior face:[2] capsule narrowly ovoid or obovoid to depressed-globose, with 3 valves: embryo slender, nearly straight to considerably curved in the hard endosperm.—Sp. Pl. 90 (1753) and Gen. Pl. ed. 5, no. 102 (1754).

The sections *Lechidium* and *Eulechea* are retained in this study and are separable by the characters under the two primary headings in the key.

Sect. I. Lechidium (Spach) Torr. & Gray, Fl. N. Am. i. 154 (1838); Robinson in Gray, Syn. Fl. N. Am. i[1]. 194 (1895); Grosser in Engler, Pflanzenr. iv[193]. 139 (1903). *Lechidium* Spach in Hook. Comp. Bot. Mag. ii. 286, 287 (1837) and Hist. Nat. Veg. Phan. vi. 112 (1838).

Sect. II. Eulechea Robinson in Gray, Syn. Fl. N. Am. i[1]. 192 (1895); Grosser in Engler, Pflanzenr. iv[193]. 134 (1903).

KEY TO SPECIES

a. Placentae crustaceous, uniting with the dissepiments to form within the mature capsule, opposite the valves, 3 distinct and prominent yellow structures, each with two cavities open at the back, serving to press the two seeds against the valve of the capsule: pedicels more than 3 mm. long: calyx 2.5 mm. broad or more. Sect. Lechidium (Spach) T. & G. ..... 1. *L. san-sabeana.*

a. Placentae and dissepiments within the mature capsule disintegrating or adhering to the seed (fragile, but prominent at maturity in *L. tripetala*): pedicels less than 3 mm. long: calyx less than 2.5 mm. broad, except occasionally in *L. tripetala.* Sect. Eulechea Robinson ....*b.*

b. Exterior sepals equaling or exceeding the interior sepals ....*c.*

[1] Linnaeus in Gen. Pl. ed. 5, no. 102 (1754), attributed the authorship of the genus to Kalm and in Amoen. Acad. iii. 10 (1756) he explained that the genus was dedicated to Professor J. Leche of Abo.

[2] Spach in Hooker, Comp. Bot. Mag. ii. 288 (1837), writes of the position of the ovules in relation to the placentae, "all the other *Cistaceae* having their ovules attached on the anterior face, or on the margins of the placentas."

c. Basal leaves elliptic-ovate to broadly lanceolate: cauline leaves narrowly lanceolate to elliptic-ovate....*d.*
d. Cauline leaves broadly lanceolate to elliptic: pubescence strongly spreading: capsule not exceeding the calyx....*e.*
e. Calyx depressed-globose, broadest toward the base, except in var. *macrotheca;* interior sepals strongly keeled, deeply concave; exterior sepals about equaling the interior ones: seeds inequilateral, strongly convex dorsally, light-brown, lustrous, the embryo clearly visible: capsule about as broad as long: fruits glomerate-clustered, except in var. *macrotheca*.....2. *L. villosa.*
e. Calyx pyriform, broadest above the middle; inner sepals slightly keeled; outer sepals exceeding the inner: seeds equilateral, elliptic-oblong, dorsiventrally compressed, dark-brown, the embryo not clearly apparent: fruits loosely clustered to closely racemose.....3. *L. minor.*
d. Cauline leaves narrowly lance-oblong: calyx very short, strongly pyriform: capsule considerably exceeding the calyx.....4. *L. patula.*
c. Basal leaves, if present, narrowly linear: cauline leaves always narrowly linear: fruiting calyx broadest below the middle or toward the base....*f.*
f. Calyx more than 2 mm. broad; sepals strongly keeled: seeds 4–6.....5. *L. tripetala.*
f. Calyx 2 mm. or less broad; sepals slightly or hardly at all keeled: seeds 1–4....*g.*
g. Calyx depressed-globose; outer sepals mostly exceeding the inner: capsule depressed-globose: seeds 2–4.....6. *L. tenuifolia.*
g. Calyx ovoid, considerably longer than broad; outer sepals about equaling the inner: capsule ovoid; seed 1.....7. *L. mensalis.*
b. Exterior sepals shorter than the interior ones....*h.*
h. Capsule greatly exceeding the calyx, its valves coalesced....*i.*
i. Cauline leaves linear-oblong, abruptly acute or obtuse: calyx nearly glabrous, strongly spreading from base of capsule and not at all enclosing it: wall of capsule papery.....8. *L. Deckertii.*
i. Cauline leaves lance-elliptic, sharply acute; calyx subappressed-pilose, firmly enclosing the base of capsule: wall of capsule indurated.....9. *L. divaricata.*
h. Capsule exceeded by to but slightly exceeding the calyx....*j.*
j. Basal leaves lance-elliptic to broadly elliptic-ovate, less than 3 times as long as broad: calyces strongly pyriform: pedicels exceeding calyx: seeds 1–2....*k.*
k. Basal leaves bright-green, thin, lance-elliptic to lance-ovate, spreading-pilose beneath on midrib and margin, glabrous above: cauline leaves mostly narrowly lanceolate: seeds 1–2 (mostly 2), dorsiventrally compressed, nearly or quite equilateral: fruits scattered, racemose.....10. *L. racemulosa.*
k. Basal leaves grayish-green, thick, broadly elliptic-ovate, densely pilose to tomentose below, strongly pilose above: cauline leaves broadly lance-ellip-

tic to ovate: capsule-wall strongly indurated; valves coalesced below: seed 1, irregularly ovoid: fruits loosely clustered, the pedicels spreading to reflexed.....11. *L. cernua.*

j. Basal leaves, when present, elliptic-lanceolate to narrowly lanceolate or linear, more than 3 times as long as broad: cauline leaves narrowly lanceolate or oblanceolate to narrowly linear....*l.*

l. Basal shoots lacking or with narrowly linear leaves: cauline leaves narrowly linear....*m.*

m. Exterior sepals nearly equaling the interior ones: capsule about equaling the calyx: sepals closely pilose: plant low, less than 20 cm. high.....12. *L. cubensis.*

m. Exterior sepals much shorter than the interior ones: calyx exceeding and concealing the capsule: sepals densely somewhat spreading-pilose: plants more than 20 cm. high.....13. *L. Torreyi.*

l. Basal shoots present at maturity: basal leaves elliptic-lanceolate to narrowly lanceolate or oblanceolate....*n.*

n. Basal leaves thick, dull-green, strongly subappressed- to spreading-pilose beneath on midrib and margin and somewhat on the lower face: panicle mostly branched from well below the middle, frequently subpyramidal, the branches gradually reduced above except in var. *subcylindrica*.....14. *L. maritima.*

n. Basal leaves thin, bright-green above, subappressed- to spreading-pilose beneath on midrib and margin, elsewhere glabrous: panicle mostly branched from above the middle....*o.*

o. Seeds 2–4, dorsiventrally compressed (2-sided) or obscurely 3-sided, nearly equilateral, elliptic-oblong or enlarged at base, smooth at maturity....*p.*

p. Stems and branches strongly pilose: calyx strongly pilose with somewhat spreading hairs: plant dull-green: branches crowded, strongly ascending to suberect: seeds 3 or 4.....15. *L. stricta.*

p. Stems and branches sparingly pilose: calyx sparingly pilose with appressed to somewhat spreading hairs: plant bright green: branches ascending to broadly spreading: seeds mostly 2 or 3.....16. *L. Leggettii.*

o. Seeds 4–6 (5 or 6 in larger capsules) except in var. *depauperata*, inequilateral and prominently 3-sided, dorsally convex with 2 subequal lateral faces meeting in a straight ventral keel, at maturity with a white reticulate membranaceous covering.....17. *L. intermedia.*

1. LECHEA **san-sabeana** (Buckley), comb. nov. Caudex simple and ascending to strongly branched and subprocumbent: basal shoots numerous, subappressed-pilose on the axis; leaves linear, abruptly pointed, glabrous above, subappressed-pilose beneath: fruiting stems several to many, 15–35 cm. tall, sparsely foliose from near the base,

at first densely pilose, at length becoming sparingly appressed-pilose: cauline leaves linear, 6–18 mm. long, 0.6–1.3 mm. broad, on the branches often smaller, glabrous on the upper surface, at first densely pilose, at length prominently subappressed-pilose beneath mainly on the midrib and margin: panicle loosely spreading-branched from below the middle; secondary branches racemose, 5–15 cm. long, simple or once branched, bearing buds, flowers and ripe fruit often simultaneously: petals dark-red, often exceeding the sepals: stamens 7–12 or more: fruits secund, spreading at right angles to the axes, loosely distributed to somewhat remote, particularly toward the tips of the branches: pedicels slender, 3–5 mm. long, at length sparsely subappressed-pilose: calyx in fruit depressed-triangular-ovoid, 3 mm. broad, slightly more than 2 mm. long; calyx-lobes broadly ovate, dark-red on the inner surface, hood-shaped, strongly keeled dorsally, deeply concave ventrally, at first densely spreading-pilose, later coarsely subappressed-pilose, strongly so on the keel and glabrous on the broad scarious margins: bracts narrowly linear, green, about equaling sepals: capsule depressed-globose, 1.2–2.2 mm. long, 2.2–2.4 mm. broad; valves deeply ovate, spreading slightly in maturity; dissepiments and placentae crustaceous, pale-yellow, firm, persistent, attached to the base of the capsule, dividing above into 3 separate seed-bearing portions, confronting the valves: seeds normally 6, 2 of them partially enclosed by each dissepiment, light-brown; embryo slightly visible through the endosperm, ventrally concave, occasionally somewhat inequilaterally bifacial, narrowed at base and abruptly narrowed to the acute apex, usually somewhat shriveled, 1–1.1 mm. long.—*Linum San-Sabeanum* Buckley in Proc. Acad. Nat. Sci. Phila. for 1861: 450 (1862). *Lechidium Drummondii* Spach in Hook. Comp. Bot. Mag. ii. 287 (1837) and in Hist. Nat. Veg. Phan. vi. 112 (1838). *Lechea Drummondii* (Spach) Torr. & Gray, Fl. N. Am. i. 154 (1838); Eaton & Wright, N. Am. Bot. 294 (1840); Walpers, Repert. i. 213 (1842); Gray, Gen. i. 206, t. 89 (1849); Coulter, Bot. W. Texas in Contrib. U. S. Nat. Herb. ii. 24 (1891); Britton in Bull. Torr. Bot. Cl. xxi. 252 (1894); Robinson in Gray, Syn. Fl. N. Am. i^{1}. 194 (1895); Chapman, Fl. So. U. S. ed. 3: 37 (1897); Small, Fl. 799 (1903); Grosser in Engler, Pflanzenr. iv^{193}. 139, fig. 22, N–V (1903).—Coastal Plain of Texas north to Dallas and Fort Worth and westward nearly to the Edwards Plateau. Texas: Enchanted Rock, Llano Co., June 1, 1930, *Tharp & Whitehouse*, no. 86,950a; sandy open ground near Moore, Frio Co., May 9, 1928, *E. J. Palmer*, no. 33,854; dry soil near Huntsville, June 2, 1914, *N. S. Young;* de Matamoros a Goliad, April, 1834, *Berlandier*, nos. 2458, 1028; in sylvis prope el Rio de Medina, July, 1829, *Berlandier*, no. 2041 = 631; S. Felipe de Austin, *T. Drummond*, no. 17 (Hooker misit January, 1835); dry banks, Hempstead, *E. Hall*, no. 31; sandy forests, Upper Cross Timbers, *Reverchon* (Curtiss, N. Am. Pl. no. 232); dry sterile places, Galveston, *Lindheimer*, no. 16; sands, Dallas, *Reverchon*, no. 52 (US); Sabine River, *Leaven-*

worth (NY); dry open ground, Bryan, Brazos Co., *E. J. Palmer*, no. 7818 (NY); San Saba Co., *Buckley* (TYPE in Herb. Phila. Acad. Sci.); San Saba Co., 1890, *Nealley* (Field); Cuero, *Bray*, no. 133 (US); Bastrop, 1928, *H. Duval* (US); College Station, June 10, 1891, *L. H. Dewey* (US); sandy soil, 20 miles south of San Antonio, *E. D. Schulz*, no. 456 (US); in sandy open oak woods at Lake Worth, Tarrant Co., *Ruth*, no. 888 (US); in sandy pasture land, Tarrant Co., *Ruth*, no. 399 (Field); Indianola, 1869, *Ravenel*, (US); Navarro Co., *Joor*, no. 83 (US); on dry flats, near Pass Izard, 1889, *F. W. Thuran* (US); Gillespie Co., *Seguaro*, no. 620 (Mo); sandy woods, Granbury, *Reverchon*, no. 52 (Mo); Aransas Pass, San Patricio Co., *Orcutt*, no. 5964 (Mo). PLATE 488, FIGS 1, 2 and 3; MAP 1.

Spach[1] divided the genus into two genera, *Lechea* and *Lechidium*. The latter was set apart on certain structural peculiarities of the species *Lechidium Drummondii*, which was described in the same article. At the same time Spach described *Lechea Drummondii* in the other genus. In brief, the description of the latter is as follows: exterior sepals longer than the interior; the capsule slightly exceeding the calyx; leaves of radical shoots ovate or elliptic, ciliate beneath; pedicels short; seeds 3, reddish-brown, smooth and shining and pellucid enough to allow the embryo to be seen through it. These characters clearly diagnose *L. villosa* Ell. Thus the name *L. Drummondii* Spach is a later synonym of *L. villosa* Ell. and may not be used, as a specific name, again in the genus.

The diagnostic characters used by Spach for the new genus *Lechidium* concern the fruit and are virtually the same which have, since his time, been employed by monographers to set apart *Lechidium* as a subgenus or section. My feeling is that it is certainly no more than a section of *Lechea;* in all superficial respects *Lechidium Drummondii* closely simulates *L. tenuifolia* and *L. tripetala*, and even in the placentae and dissepiments there is most certainly an approach to those of the last named species. The distinctive peculiarities, the extreme length of the pedicel, the very large fruits and the definite and persistent placentae and dissepiments are definite enough to allow me to follow Gray,[2] Robinson[3] and Grosser[4] in conserving the section. A new name, therefore, is needed for the plant now passing as *L. Drummondii*. The only other name ever given to it was *Linum San-Sabeanum* Buckley. Gray had seen Buckley's collection and found it to

[1] Hook. Comp. Bot. Mag. ii. 284–289 (1837).
[2] Gen. i. 206 (1848).
[3] Syn. Fl. N. Am. i[1]. 194 (1895).
[4] Engler, Pflanzenr. iv[193]. 139 (1903).

be identical with the plant which he called *Lechea Drummondii*. I also have seen the type and agree with his identification; but, according to the present rules of Nomenclature, the name must be *Lechea san-sabeana*.

2. L. VILLOSA Ell. Caudex low, simple or slightly to strongly suberect-branched: resting basal shoots numerous or lacking, 4–10 cm. long, branching or simple; the axis densely villous: basal leaves large (0.8–1.5 cm. long), crowded, mostly whorled, bright- to dark-green, broadly elliptic-ovate, mucronate-pointed or narrower and with a less distinct mucro when mature, glabrous above, villous beneath on midrib and margin: axes of developing shoots strongly villous to subappressed- or spreading-pilose; their leaves sparsely to densely villous over the entire lower surface or at least on midrib and margin and often slightly subappressed- to spreading-pilose above, or strongly subappressed-pilose over the entire lower and upper surfaces: fruiting stems one to several, 15–90 cm. high, erect to spreading, closely subcylindric-paniculate to broadly spreading-branched; the axes sparingly to densely villous or spreading-pilose either their entire length or in the panicle; the branches short, consisting essentially of fruit-clusters, or long and leafy, suberect to spreading: cauline leaves spreading to appressed, bright- to dull-green, distinctly petiolate to sessile, oblanceolate or lance-elliptic and mucronate to lanceolate or oblanceolate and acute or pointed, sparsely but conspicuously villous on the lower surface, scatteringly spreading-pilose to glabrous on the upper surface or densely spreading-pilose on both surfaces: fruit deep purplish- to greenish-brown, strongly glomerate to diffuse-glomerate or scattered-secund: pedicels 0.8–1.5 mm. long, sparsely spreading-pilose: calyx 1.4–2 mm. long, with a short yellowish-brown obconic base, about as broad as long, broadest near the base or spreading above and slightly pyriform; inner sepals from one-half to two-thirds as broad as long, with broad scarious margins, scatteringly pilose on the conspicuous keel; outer sepals narrowly lanceolate to linear and nearly or quite equaling the inner ones of broadly lanceolate (1.9–2.2 mm. long, 0.4–0.7 mm. broad) and equaling or exceeding the inner: capsules lustrous, depressed-globose, about equaling calyx; valves ovate, obtuse, broadly keeled, when mature separating to the base: seeds with a clear (transparent) endosperm with the embryo distinctly visible, decidedly inequilateral, 2-sided or obscurely 3-sided, greatly enlarged at base, abruptly acute at apex; if 3 or 4 bright-brown to clear-yellow, mostly lustrous, strongly convex dorsally, concave ventrally or flattened, 0.9–1 mm. long, 0.5–0.6 mm. broad; if 2 light-brown to pale-yellow, lustrous to dull, convex dorsally, concave ventrally, 1–1.2 mm. long, 0.6–0.7 mm. broad.

a. Fruit small: calyx less than 2 mm. long, broadest near the base; the exterior sepals linear, slightly shorter than to equaling the inner: seeds 3–4, 1 mm. or less long.

Plant bright-green: fruiting stems few, erect, tall: basal resting shoots conspicuous: pubescence on most of plant distinctly villous: cauline leaves spreading, sparingly spreading-pilose to villous beneath, glabrous to sparingly spreading-pilose on the upper surface.....Var. *typica.*

Plant dull- or grayish-green: fruiting stems several, spreading, low: basal resting shoots lacking: cauline leaves subappressed: pubescence mostly densely spreading-pilose, equally on the upper and the lower surfaces..Var. *Schaffneri.*

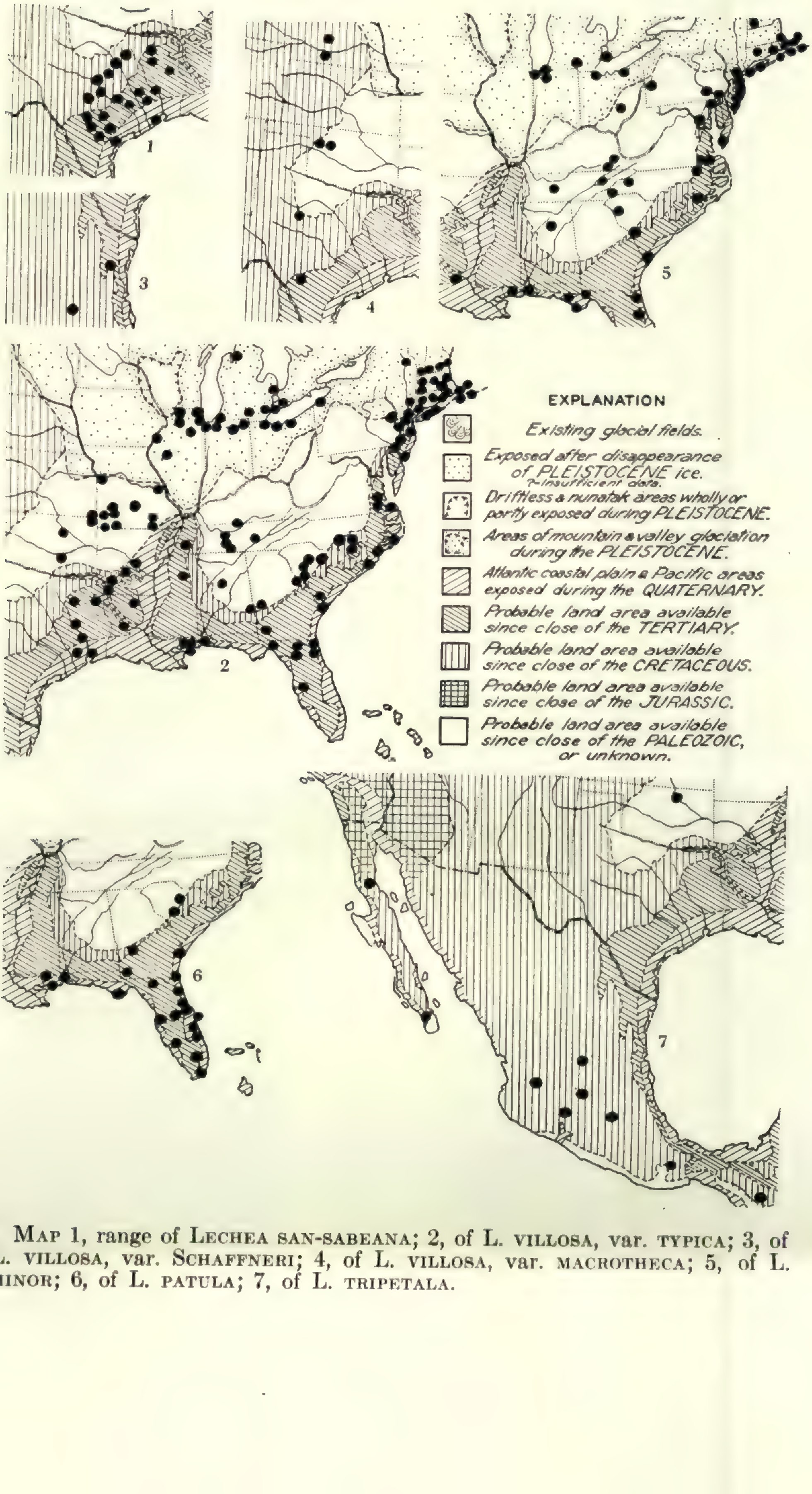
a. Fruit comparatively large: calyx 2 mm. or more long, pyriform, broadest at the middle; the exterior sepals large, lanceolate, equaling to slightly exceeding the inner: seeds 2, more than 1 mm. long.....Var. *macrotheca.*

Var. **typica.** Caudex low, simple: resting basal shoots numerous, bright-green, frequently branching, large, 5–10 cm. long, developing in September except in southern United States; the axes densely villous: their leaves short-petioled, crowded, mostly in whorls, bright green, broadly elliptic-ovate, the lower ones mucronate, glabrous on the upper surface, conspicuously villous beneath on midrib and margin: fruiting stems few, erect; their axes brownish-purple, conspicuously villous: panicles closely subcylindric to broadly pyramidal; primary branches short (1–3 cm.) and consisting essentially of fruiting clusters, or up to 12 or 15 cm. long and erect or spreading and leafy: cauline leaves bright-green, spreading, 1–3 cm. long, with a distinct petiole 1–3 mm. long, oblanceolate to lance-elliptic, mucronate, conspicuously but sparsely villous on the lower surface, sparsely spreading-pilose above: fruits glomerate at ends of the primary or, in greatly branching plants, at the tips of the secondary branches: pedicels 1–1.5 mm. long, sparsely spreading-pilose; calyx depressed-globose, dark brown, broadest below the middle, meeting the pedicel in a short obconic yellowish-brown base; interior sepals broadly lance-elliptic, subacute, 1.3–1.6 mm. long, deeply concave, prominently keeled and with broad scarious margins, conspicuously pilose only on the keel; exterior sepals narrowly lanceolate to linear, nearly or quite equaling the inner: capsule depressed-globose, about equaling the calyx, 1.4–1.7 mm. long: seeds mostly 3, bright-brown to clear-yellow, lustrous, strongly convex dorsally, concave or flattened ventrally, 0.9–1 mm. long, 0.5–0.6 mm. broad.—*L. villosa* Ell. Sk. Bot. S. Car. & Ga. i. 184 (1816): Dunal in DC. Prod. i. 285 (1824); Beck, Bot. N. & Mid. St. i. 36 (1833); Darlington, Fl. Cestrica, 96 (1837); Dietr. Syn. Pl. i. 415 (1839); Britton in Bull. Torr. Bot. Cl. xxi. 248 (1894); Britton in Britton & Brown, Ill. Fl. ed. 1, ii. 442, fig. 2477 (1897); Britton, Man. 632 (1901); Small, Fl. 798 (1903); Robinson & Fernald in Gray's Man. ed. 7: 578 (1908); Stone, Pl. So. N. J. 563, pl. 83, fig. 1 (1911); N. Taylor, Fl. Vic. N. Y. 448 (1915); Small, Man. 882 (1933). *L. major* sensu Michx. Fl. Bor.-Am. i. 76 (1803); sensu Ait. f. Hort. Kew. ii[1]. 185 (1810); sensu Bigelow, Fl. Bost. 28 (1814); sensu Pursh, Fl. Am. Sept. i. 90 (1814); sensu Eaton, Man. ed. 2: 296 (1818); sensu Barton, Fl. Phil. 75 (1818); sensu Torrey, Fl. i. 60 (1824); sensu Eaton &

Wright, N. Am. Bot. 294 (1830); sensu Torrey & Gray, Fl. N. Am. i. 153 (1838); sensu Darby, Man. Bot. So. St. ii. 33 (1841); sensu Torrey, Fl. N. Y. 78 (1843); sensu Gray, Man. 49 (1848); sensu Chapman, Fl. So. U. S. 36 (1860) and subsequent editions including ed. 3; sensu Leggett in Bull. Torr. Bot. Cl. vi. 251 (1878); sensu Robinson in Gray, Syn. Fl. N. Am. i^{1}. 192 (1895); not L. *L. minor* sensu Smith in Rees's Cycl. 20 (1819). *L. Drummondii* Spach in Hook. Comp. Bot. Mag. ii. 284 (1837) and in Hist. Nat. Veg. Phan. vi. 110 (1838), including in greater part the *L. major* var. *villosa* Grosser in Engler, Pflanzenr. iv^{193}. 136 (1903). *L. mucronata* Raf. New Fl. N. Am. i. 193 (1836); sensu House, Annot. List Ferns & Fl. Pl. N. Y. 497 (1924); not *L. mucronata* of Raf. Précis des Découvertes, 37 (1814); *L. major* var. α. *villosa* Grosser in Engler, Pflanzenr. iv^{193}. 136 (1903).—Generally abundant in sandy or gravelly soils in fields and open woods or on open slopes, southern New Hampshire to Florida, west to Michigan, Oklahoma and eastern Texas; absent from the Appalachian Mountains. Var. *typica* is so definite a plant that it is unnecessary to cite the numerous specimens examined. PLATE 488, FIGS. 4, 5, and 6; MAP 2.

Var. **Schaffneri,** var. nov. Caudex multiceps ramosus ramis gracilibus sine ramis basilaribus; caules fructiferi plures suberecti 15–40 cm. alti dense patuleque pilosi vel villosi; folia subadpressa lanceolata vel oblanceolata anguste acuta vel acuminata opaca viridia supra et subtus dense patuleque pilosa 8–15 mm. longa 2.5–5 mm. lata; panicula anguste subpyramidata, rami breves valde ascendentes; flores in glomerulos laxos vel racemos densos dispositis.—Mountains of central Mexico. I have seen the following specimens. TAMAULIPAS: La Vegonia, vicinity of San Jose, alt. 3000 ft., *H. H. Bartlett*, no. 10,020 (US). SAN LUIS POTOSI: in montibus San Rafael, 1876, *Schaffner*, no. 602 (TYPE in Gray Herb.), 1879, *Schaffner*, no. 471 (US). MAP 3.

Var. **macrotheca,** var. nov. Caudex plerumque multiceps ramis brevibus; rami basilares 1.5–3 cm. longi eorum folia late lanceolata patule pilosa vel villosa; folia caulina lanceolata vel oblanceolata acuta 1–3 cm. longa 2–7 mm. lata supra et subtus pilosa pilis patulis vel subadpressis; flores laxe glomerati vel dense secundo-racemosi; pedicelli 1 mm. aut minus longi; calyx late pyriformis pallide brunneus supra basin valde dilatatus 1.9–2.1 mm. longus 1.9–2 mm. latus; sepala interiora lanceolato-elliptica acuta 2-plo longiora quam lata; sepala exteriora lanceolata 1.9–2.2 mm. longa 0.4–0.7 mm. lata interiora aequantia vel paullo superantia saepe lucida 1–1.2 mm. longa 0.5–0.7 mm. lata inaequilateralia latere dorsali convexa ventrali concava vel rarius convexa et subangulata.—Sand-hills, prairies and sandy woods, west-central Nebraska to southern Texas. The following specimens have been seen. NEBRASKA: sand-hills, Loup Fork, August 26, 1853–1854, *F. V. Hayden* (Mo); prairies and sand-hills of Kearney Co., *Rydberg*, no. 6632 (NY); Minden, July, 1892, *Hapeman* (NY); Minden, August, 1893, *Hapeman* (US). OKLAHOMA: in open



Map 1, range of Lechea san-sabeana; 2, of L. villosa, var. typica; 3, of L. villosa, var. Schaffneri; 4, of L. villosa, var. macrotheca; 5, of L. minor; 6, of L. patula; 7, of L. tripetala.

sandy woods, near Cleo, Major Co., *G. W. Stevens*, no. 1728 (TYPE in Gray Herb.); Woodward Co., July 14, 1900, *Paul J. White* (Mo). TEXAS: sandy open ground, Fort Chadburn, Coke Co., *E. J. Palmer*, no. 12,453. PLATE 488, FIGS. 7 and 8; MAP 4.

H. D. House[1] has taken up the name *Lechea mucronata* of Rafinesque for our *L. villosa*. The former name antedates by two years the latter which, according to Barnhart,[2] was published in 1816. Grosser[3] in his monographic treatment cited *L. mucronata* as a synonym of *L. major*, our *L. villosa*. The only possible diagnostic features of Rafinesque's description are embodied in the following[4] "feuilles oblongues-cuneiformes mucronées, fleurs en grappe composée." So many species have the "fleurs en grappe composée" that this portion of Rafinesque's diagnosis might apply to most members of the genus. The other phrase "feuilles oblongues-cuneiformes mucronées," applies equally well to *L. minor* and to *L. villosa* as do the brief diagnostic phrases for some others of Rafinesque's proposed species. Without type-material to show exactly what the author had, it is futile to guess; and only confusion can result by overthrowing a well characterized and clearly typified name, such as *L. villosa*, by taking up for it a vague name which must always be open to doubt. Elliott[5] indicated definitely what he had. Following a brief Latin description is a discussion, part of which I quote, "the radical and young stem branches covered with white hairs . . . branches 2–4 ins. long that trail on the ground . . . seed 1 in each cell, oblong, angled at one side, acute at each end. . . This plant if kept from running to seed would probably form a very neat edging for the beds of a flower garden." Dr. Svenson of the Brooklyn Botanic Garden told me in 1933 that there was an occasional demand there for seed of *L. villosa* for horticultural purposes. Horticulturally, any other species would, I believe, receive no more than passing attention and that only by seekers of the curious. Elliott's *L. villosa* is supported further by a type specimen, which Britton,[6] p. 248, states is in the Elliott Herbarium. In 1836 Rafinesque again used the name *L. mucronata*, accompanying it this time with a more complete but weak description and with a statement that it was the same as Elliott's *L. villosa*. It is

[1] Annot. List Ferns & Fl. Pl. N. Y. 497 (1924).
[2] Bull. Torr. Bot. Cl. xxviii. 680–688 (1901).
[3] Engler, Pflanzenr. iv[193]. 136 (1903).
[4] Précis des Découvertes et Trav. 37 (1814).
[5] Sk. Bot. S. Car. & Ga. i. 184 (1816).
[6] Bull. Torr. Bot. Cl. xxi. 247, 248 (1894).

enough to say that there will always be confusion in our minds regarding Rafinesque's Lecheas. The name *L. major* has been used until recently for our *L. villosa*, despite the fact that Elliott, l. c., accurately states in the synonymy of *L. villosa* "*L. major* not of Linn. which was an *Helianthemum*." Smith[1] also realized this important fact but, from the mixture of species which Linnaeus had in his herbarium representing *L. minor*, Smith chose a specimen of *L. villosa* as typical. That he doubted the advisability of the choice is manifest by the following quotation, "Amid all this uncertainty we would rather strike out *L. major* and give a new name perhaps heterophylla to our *minor*." Britton[2] has given the currently accepted interpretation of the Linnean type of *Lechea*. The specimens of *L. villosa* which are represented in the Linnean Herbarium are not referable in any way to the description in the *Species Plantarum*. The specimen which is directly referable to the description is the very distinct species which we now call *L. minor* (see discussion of that species).

Much of the southern material, including the Virginia and Florida specimens, differs in habit from most of the northern plants. Close checking revealed no fundamental differences. Seeds, capsules and calyces, as well as leaves, were alike in both. The northern plant, limited by the growing season, produces fruit in dense clusters on short branches, which are borne in a compact spire-like inflorescence. Along the coast from Virginia to Florida and Texas the vegetative development is frequently more extensive. In Florida the fruiting stems may become perennial near their bases, sending out lateral branches at intervals along the axis, resulting, after a time, in a broadly branched plant. The usual effect of the longer growing season on *L. villosa*, as on other species, is to increase the vegetative growth, which may serve to initiate structural differentiation in some members of the genus. The increased growing season has not, however, brought about any differences in *L. villosa* greater than those earlier described. I do not consider that these differences deserve formal rank, because of the great variation in habit of the species throughout its range. They seem, however, to permit of an explanation and only for that reason do I mention them here.

Lechea villosa var. *Schaffneri* differs somewhat strikingly from var. *typica* by its shrubby base, lack of basal shoots, mostly low tufted

[1] Rees's Cycl. 20 (1819).
[2] Bull. Torr. Bot. Cl. xxi. 247, 248 (1894).

habit and dull-green color, which may be accounted for, probably, by the very strong development of pubescence on the upper surfaces of the lanceolate leaves. These are considerably narrower than those of var. *typica*. As in several other tropical and subtropical species of the genus, basal resting shoots are lacking. The new shoots develop immediately from the caudex, near the base, or above from persisting stems, and at first have slightly broader leaves than in the mature condition. In such capsules as were mature enough for study there were mostly four seeds. Plants of *L. villosa* var. *typica* in a similar stage of development have mostly three seeds in each capsule. Not enough specimens, however, of the Mexican variety have been seen to make a safe generalization. The fruits in other respects closely resemble those of typical *L. villosa*, except that they are produced in fewer clusters of less densely aggregated individuals.

It is difficult to say whether there were two distinct collections of this plant by Schaffner. In the Gray Herbarium is a sheet labelled "in montibus San Rafael, 1876, no. 602" and in the United States National Herbarium is another labelled "San Luis Potosi: 1879, Dr. J. G. Schaffner, no. 471." The single sheet of Schaffner's collection in the New York Botanical Garden is given both of these numbers. Grosser[1] cites the Schaffner material as two separate numbers. In a discussion of Schaffner's work, Hemsley[2] says, "From time to time further contributions were received from him, the last in 1881, through Dr. Asa Gray, from the neighborhood of San Luis Potosi where he resided some time before his death . . . unfortunately each collection was separately numbered." It is difficult then to say whether we have one or more than one collection of *L. villosa* var. *Schaffneri* by Schaffner, especially since the specimens are of a similar age and appearance.

Lechea villosa var. *macrotheca* differs from the wide-ranging var. *typica* and from var. *Schaffneri* in its short basal shoots which bear lanceolate leaves, its less striking villosity throughout, the paler-brown, much larger and more scattered fruit, the narrower lanceolate leaves which are usually strikingly pilose above, the two large seeds contrasted with the 3 (4) of var. *typica* and, perhaps most striking of all, in the extremely large exterior sepals (the largest in the genus).

3. L. MINOR L. Caudex simple or with a few short ascending branches: basal shoots in September and October slender, mostly not

[1] Engler, Pflanzenr. iv[193]. 136 (1903).
[2] Biol. Centr. Am. iv. 134, 135 (1886–1888).

exceeding 5 cm. in length, subappressed-pilose; their leaves mostly verticillate, frequently in whorls of 3, ovate to elliptic-ovate, mucronate, 4–7 mm. long, about half as broad, spreading-pilose to subvillous beneath on midrib and margin, frequently sparingly scattered-pilose above: fruiting stems 1 to several, slender, leafy, 20–50 cm. high, with numerous short ascending to appressed primary branches or with long ascending primary branches and short ascending secondary ones: panicle compact, leafy, mostly narrowly subcylindric (occasionally much broader, to subglobose); the axis with fine subappressed to spreading incurved hairs: cauline leaves bright-green, short-petioled; those below the panicle frequently in whorls of 3 or 4, elliptic-ovate to lanceolate, mucronate, finely, often inconspicuously, spreading-pilose over the entire surface above and beneath; those in the panicle mostly scattered, lance-oblong to narrowly lanceolate or oblanceolate, slightly or not at all mucronate, inconspicuously pilose beneath, mostly glabrous above; rameal leaves similar to the upper cauline, often very small: fruits mostly clustered, at times scattered or even secund: pedicels 1–2 mm. long, sparsely subappressed-pilose: calyx pyriform, with a short, pale nearly glabrous obconic base, 1.6–2 mm. long, 1.2–1.5 mm. broad; inner sepals brownish-green, subappressed-pilose, distinctly keeled, narrowly elliptic-ovate, obtuse, abruptly narrowed near base; outer sepals bright-green, narrowly lanceolate to linear, equaling to considerably exceeding the inner ones: capsule about equaling the calyx, lustrous, ellipsoid-ovoid to elongate-ellipsoid, often appearing slightly inequilateral; the valves slightly unequal in length or breadth or both: seeds 2–3, light- to dark-brown, dull, 0.9–1.1 mm. long, narrowly elliptic-ovate to lanceolate, subacute, nearly equilateral, dorsi-ventrally compressed, but slightly convex dorsally and flattened beneath or obscurely 3-sided and conspicuously angled ventrally.—Sp. Pl. 90 (1753); Britton in Bull. Torr. Bot. Cl. xxi. 247 (1894); Britton in Britton & Brown, Ill. Fl. ii. 442, fig. 2475 (1897); Britton, Man. 632 (1901); Grosser in Engler, Pflanzenr. iv[193]. 135 (1903); Small, Fl. 798 (1903); Robinson & Fernald in Gray's Man. ed. 7: 578 (1908); Stone, Pl. So. N. J. ii. 562, pl. 83, fig. 3 (1911); Small, Man. 882 (1933). *L. thymifolia* Michx. Fl. Bor.-Am. i. 77 (1803); Elliott, Sk. Bot. S. Car. & Ga. i. 185 (1816); Smith in Rees's Cycl. xx. (1819); Leggett in Bull. Torr. Bot. Cl. vi. 251 (1878); Chapman, Fl. So. U. S. ed. 2, Suppl. 678 (1892) and ed. 3: 37 (1897); not Pursh. *L. Novae-Caesareae* Austin in Gray, Man. ed. 5: 81 (1867); Wood, Am. Bot. & Florist, 47 (1870).—The Coastal Plain and inland in river-valleys, Massachusetts to Louisiana, in the mountain regions of North Carolina, Kentucky, Tennessee and Alabama, and in the region of the lower Great Lakes. I shall omit citing specimens of this clearly defined and unusually constant species. Map 5.

In 1894, Britton[1] discussed the typification of the quite inadequately diagnosed Linnean *Lechea minor*. There are, according to Britton,

[1] Bull. Torr. Bot. Cl. xxi. 247 (1894).

several species represented in the Linnean Herbarium. The only specimen, however, which is directly referable to the description is the one marked, "Capraria fol. integerrimis, fl. virg.," this phrase also being cited after Linnaeus' very brief description of *L. minor*.[1] Britton chose this specimen for the TYPE of *L. minor*. It is the plant with which we are here concerned.

Until Britton cleared up the situation the name *Lechea minor* was regularly applied to at least two others of our northeastern species, *L. Leggettii* and *L. intermedia*, and, at times, to *L. tenuifolia*, *L. maritima* and *L. racemulosa*. Under the separate treatment of these will be found further discussions of their identification with *L. minor*.

Lechea thymifolia of Michaux is difficult to place by its very brief description, but Leggett,[2] under his discussion of this species, remarks, "distinguished by its long outer sepals, and leafy panicle. I have received a fragment of Michaux's specimen by the kindness of Prof. Decaisne". On the basis of Leggett's statement I admit this name in the synonymy of *L. minor* L. The greater number of American authors since Michaux and to the time of Britton, excepting Pursh, followed Michaux in using the name *L. thymifolia* for the species here treated as *L. minor*.

Lechea novae-caesareae Austin is, as shown by the type material, referable to our *L. minor*.

Grosser[3] cites as synonyms of *Lechea minor* L. Rafinesque's *L. secundiflora*, *L. pauciflora*, *L. brevifolia* and *L. uniflora*. Recourse to their original descriptions[4] shows that not one would apply to the plant we know as *L. minor* L. and which Grosser clearly described in the monograph, l. c. *L. secundiflora* has, "leaves scattered, lax, narrow, linear . . . flowers remote secund," characters which delineate *L. tenuifolia*, inasmuch as the remainder of the description clearly applies to it. *L. pauciflora* with "leaves scattered, slender, linear cuneate . . . small plant only 3 inches high" is apparently an ecological variant of some other species which, in the complete absence of other pertinent data, is unrecognizable. *L. brevifolia* is closer to *L. minor* L. Portions of the description, "leaves scattered petiolate short lanceolate or oblong ciliolate mucronate," apply to our species but by the phrase "flowers secund, pedicels equal" Rafinesque again

[1] Sp. Pl. i. 90 (1753).
[2] Bull. Torr. Bot. Cl. vi. 251 (1878).
[3] Engler, Pflanzenr. iv[193]. 135 (1903).
[4] New Fl. N. Am. i. 95, 96 (1836).

shows that he probably had a confused notion of the plant he described. *L. uniflora* is an extraordinary form which Rafinesque saw in his travels, "Summits of the Alleghany Mts. of Maryland disc. 1825, only 3 or 4 ins. high, only 5 or 6 leaves and one or 2 flowers, capsule commonly with 6 oval seeds." It is hopeless to try to identify this particular one of Rafinesque's Lecheas.

One species, *Lechea stellata*, cited under *L. minor* L. by Grosser, may be taken to fit our conception of *L. minor* L. Rafinesque's description, in part, "leaves 3–4 nate petiolate, elliptic mucronate, upper leaves alternate lanceolate . . . pedicels shorter . . . external sepals very long," applies to *L. minor* L. and no other. The "pedicels shorter" is in relation to the length of the flower. Leggett, discussing Rafinesque's treatment, states of *L. stellata*, "this is undoubtedly the *L. thymifolia* of Michaux, Pursh, Smith, etc., the *Nova-Caesarea* Austin."

Lechea minor, like *L. racemulosa*, though a Coastal Plain species, is found also on some of the Appalachian summits and near Lakes Erie and Michigan. Unlike *L. racemulosa*, however, it has succeeded either in establishing itself in New England since the Wisconsin or in maintaining itself there in more favored localities during that phase of glaciation. Its localization in New England and the fact that on Cape Cod it is growing, most frequently, in company with ancient genera of the Coastal Plain (*Aletris, Lachnanthes, Drosera*, sect. *Indicae*, etc.) indicate that it probably has not migrated northward from the southern limits of the latest Wisconsin advances of ice. Furthermore, *L. minor* varies very little, having produced no geographical varieties in recent time, despite its occurrence in such widely separated and dissimilar localities. It is in no sense a weedy species. The specimens which I have seen on Cape Cod are mostly restricted to narrow borders on the upper shores of the ponds so numerous in that region. They are in no sense adaptable or aggressive as are *L. villosa, L. intermedia* and *L. maritima*.

4. L. PATULA Legg. Plant dull-green, subherbaceous, with a simple to slightly branching caudex, or suffruticose and with annual upper branches: basal shoots of the subherbaceous plants and new branches of the suffruticose plants appearing in winter; leaves of the early or resting shoots narrowly elliptic to narrowly oblong, acute, 3–5 mm. long, 0.7– slightly more than 1 mm. wide, prominently and finely pilose beneath with mostly spreading short hairs on midrib and margin, frequently sparingly so elsewhere, glabrous on the upper surface:

leaves of the developing shoots large, frequently 1–1.5 cm. long, spatulate-oblong to lance-elliptic, slightly pilose above: fruiting plants 15–70 cm. high, the short plants densely and closely branched, the tall ones openly spreading-branched: flowers scattered-racemose on the straight and mostly spreading secondary and tertiary branches or crowded toward their tips: stamens few, variable in number (often 6): flowering period often of considerable duration, both mature fruit and flowers occurring simultaneously on old woody plants: fruits scattered-racemose to crowded: pedicels less than 2 mm. long (often about 1.5 mm.), sparsely subappressed- to spreading-pilose: calyx sparsely pilose to nearly glabrous, distinctly pyriform, somewhat spreading, not clasping the capsule; inner sepals slightly concave, lance- to narrowly oblong-elliptic, obtuse; exterior sepals linear, equalling to exceeding the inner: capsule with a broad blunt apex, elongate-ellipsoid to -obovoid, 1.6–1.9 mm. long, 0.9–1.1 mm. broad, considerably exceeding the calyx; the valves in maturity splitting apart only toward the apex: seeds 1 (2), dark-brown, with embryo not visible, subequilateral, slenderly ovoid or somewhat compressed dorsiventrally, 1–1.2 mm. long, about half as broad.—Bull. Torr. Bot. Cl. vi. 251 (1878); Britton in Bull. Torr. Bot. Cl. xxi. 250 (1894); Robinson in Gray, Syn. Fl. N. Am. i^{1}. 194 (1895); Chapman, Fl. So. U. S. 37 (1897); Grosser in Engler, Pflanzenr. iv^{193}. 138 (1903); Small, Fl. 799 (1903) and Man. 882 (1933), including *L. exserta* Small, Man. 882 (1933) and *L. prismatica* Small, Man. 882 (1933).—Sandy soil, often in pine forests, South Carolina to Florida and Mississippi, frequently inland. The following are characteristic. South Carolina: Camden, Kershaw Co., *H. D. House*, no. 2641 (US); Aiken, August 1, 1873, *Ravenel*. Georgia: sand flats between Savannah and Bonaventure, August 31, 1913, *B. M. Duggar* (Mo); dry pine-barrens, Leslie, *Harper*, no. 485; dry pine-barrens along Spring Creek, near Brinson, Decatur Co., *Harper*, no. 1927; dry sand near open pond, Decatur Co., *Harper*, no. 1206. Florida: Jacksonville, 1873, *H. D. Keeler;* dry sandy pine-barrens, *Chapman*, no. 4134; dry pine-barrens, Duval Co., *Curtiss*, no. 232** (type, Herb. N. Y. Bot. Gard.); Lake City, Columbia Co., *Nash*, no. 2490; St. Augustine, January, 1873, *M. C. Reynolds* (NY); Huckleberry Creek, Apalachicola, October 26, 1893, *Chapman* (Mo); sand-dunes, Daytona to Mosquito Inlet, Volusia Co., *Small & DeWinkeler*, no. 9710 (NY); dry pine-barrens, Eau Gallie, *Curtiss*, no. 5833; Cape Canaveral, East Coast, *A. B. Burgess*, no. 614 (Field); New River, December 26, 1895–January 11, 1896, *A. S. Hitchcock* (Field); dry sandy soil, Sanford, June 28, 1920, *S. Rapp* (NY); vicinity of Eustis, Lake Co., *Nash*, no. 1599; high pine-land, Jessamine, Pasco Co., *Barnhart*, no. 2626 (Field); coastal dunes opposite Melbourne, *Small, Small & DeWinkeler*, no. 10,339 (NY); pine-lands 10 miles west of Vero, St. Lucie Co., *Small, Small & Mosier*, no. 11,098 (NY); pine-lands west of Halendale, Broward Co., *Small, DeWinkeler & Mosier*, no. 11,089 (NY), the type of *L. exserta* Small;

scrub, east of Sebring, De Soto Co., *Small & DeWinkeler*, no. 9787 (NY), the type of *L. prismatica* Small; scrub, ancient sand-dunes between Avon Park and Sebring, *Small, Small & DeWinkeler*, no. 10,753 (NY); pine-lands between Miami and Cocoanut Grove, *Small*, no. 4094 (NY); hammocks, west of Cocoanut Grove, Dade Co., *Small*, no. 7964 (NY); Miami, *Small & Nash*, no. 53 (NY). ALABAMA: sandy pine-ridges, Springhill, October 4, 1894, *Mohr*, no. 11 (NY); common in woods, Spring Hill, *Bush*, no. 162 (US). MISSISSIPPI: Pass Christian, July, 1881, *Langlois* (Field); Horn Island, July 25, 1897, *C. F. Baker*, no. 688 (NY); Horn Island, Biloxi, July 16, 1894, *Tracy* (NY); very dry open soil in pine woods, Biloxi, October 7, 1896, *Kearney* (US). MAP 6.

Leggett's discussion of *Lechea patula*[1] is clear and complete enough to diagnose that species. No types were indicated. Leggett stated, however, that the name *patula* referred "to the broadly spreading branches and branchlets in specimens from S. Carolina." I have seen none of Rugel's specimens, which are mentioned by Britton[2] and by Grosser.[3] Britton states that the TYPE is in the Columbia College Herbarium but cites no specimens. None of the specimens in the herbarium of the New York Botanical Garden are marked "nov. spec." but several in the Gray Herbarium are so marked. Of the specimens cited by monographers of the genus *Lechea* since 1878 that of *Curtiss*, "Duval Co., Florida, N. Am. Pl. no. 232**", is an excellent example. Because of this and the fact that it is in the most important herbaria, I have selected it as the TYPE.

Grosser,[4] following the Index Kewensis, lists *Lechea sessilifolia* Raf. as a synonym of *L. patula*. Rafinesque[5] described *L. sessilifolia* as having "sessile flowers." It is placed in his subgenus *Eudiexa*, having, among other characteristics, "3–9 seeds." Quite obviously this is not *L. patula*, which usually has 1, but occasionally 2 seeds in a single capsule, never more, to my knowledge.

Lechea patula, like the other partly shrubby Lecheas of the southeastern United States, is astonishingly variable in the size and shape of the leaves produced at different stages of growth. The rather striking and sharp contrast in basal and cauline leaves met with in more northern species is quite lacking in this species, in which growth may and does occur throughout the year. By slow and constant

[1] Bull. Torr. Bot. Cl. vi. 251 (1878).
[2] Bull. Torr. Bot. Cl. xxi. 250 (1894).
[3] Engler, Pflanzenr. iv[193]. 138 (1903).
[4] Engler, Pflanzenr. iv[193]. 138 (1903).
[5] New Fl. N. Am. 97 (1836).

differentiation, the shoots often develop with hardly any rest-period. They may arise either from the base of the plant or from higher on the stem or branches. Two genetically similar plants would be quite dissimilar in leaf-size and -shape at different seasons of the year. It is not surprising, then, that Small[1] has described two species which, after an extended comparative study, I find are but growth-phases of *L. patula*. Both are from southern Florida, in a winterless climate which obviously causes a greater and more extended vegetative (woody) growth to take place than is possible, for example, in South Carolina. Both are striking enough as individuals to warrant attention.

In the description of *Lechea prismatica*, Small mentions ". . . . basal shoots with narrowly linear-elliptic to linear-spatulate leaf-blades." On the type-specimen (scrub, east of Sebring, De Soto Co., *Small & DeWinkeler*, no. 9787), there are no basal shoots, so-called, but the other collection representing the species (scrub, ancient sand-dunes between Avon Park and Sebring, *Small, Small & DeWinkeler*, no. 10,753) consists of a specimen with well developed (very advanced) young shoots which are producing the nearly mature foliage described by Small in the above passage. A few lingering lance-elliptic leaves indicate that the development of the shoot is that typical of *L. patula*.

Except in the greater limits of size attributed to *Lechea prismatica* by Small his descriptions of this species and of *L. patula* are very similar. The only distinguishing features mentioned are (1) "the ellipsoid-prismatic capsule" of *L. prismatica*, contrasted with the "oval often broadly so" capsule of *L. patula* (hardly a significant difference to one who is acquainted with the variation within certain limits of a single structure in this or any other species of *Lechea*) and (2) the "very long outer sepals" of the former, contrasted with the "shorter ones" of *L. patula* (here again not an important feature, except as we can compare the length of sepals with some other part of the same plant). It may be that Small has something here worthy of varietal or specific rank. Until more material has been collected and the vegetative development shown to produce plants which differ essentially from *L. patula*, in comparative stages of growth, I must consider the plant to belong to *L. patula*. Small himself collected a specimen (coastal-dunes opposite Melbourne, no. 10,339) which he did not name but which closely resembles the specimens he labeled *L. prismatica*.

[1] Man. 882 (1933).

Lechea exserta Small, l. c., is represented by one sheet (pine-lands west of Halendale, Broward Co., *Small, DeWinkeler & Mosier,* no. 11,089). The specimen lacks developing shoots and appears definitely to be *L. patula* in a robust and highly fertile form. On this specimen the exterior sepals reach the lower limit of size for the species. Without more material of a similar character I hesitate to call this anything but *L. patula.*

Nearly all of the South Carolina, Mississippi and Alabama specimens which, at first glance, appear to be distinct from those of Small's collecting were collected during the summer or early fall. Small's plants were invariably of late fall or winter. The difference would be conspicuous inasmuch as *L. patula* matures its fruit over a considerable period of time and undergoes progressive transformations (above described) in the size and shape of its leaves.

When all of these facts are taken into consideration we must bring together under one species (*Lechea patula*) the material described by Small as *L. prismatica* and *L. exserta,* as well as the somewhat diversified group of plants having the pronounced characteristics of the type.

5. L. TRIPETALA (Moç. & Sess.) Britton. Caudex woody, extensive, usually multicipital, mostly decumbent, its branches generally devoid of leaves but in the spring sending forth densely pilose shoots bearing leaves essentially similar to but smaller than the adult foliage; these shoots developing immediately (without a rest-period) into the erect to semi-prostrate annual or perennial flowering stems: flowering stems numerous, bearing fine wiry branches from below the middle, densely leafy, sparsely pilose with mostly fine spreading hairs below and with more appressed hairs above and on the branches: panicles with spreading branches interlaced to form a broad depressed-globular crown, 15–20 cm. tall, frequently of greater breadth; lower branches with secondary branches, the uppermost simple: cauline and rameal leaves linear, abruptly subacute at both apex and base, 6–12 mm. long, 0.7–1.3 mm. broad, pilose with somewhat spreading hairs on the lower surface, most abundantly so on the midrib, slightly pilose to glabrous above: fruits mostly secund, particularly on the upper simple branches, on occasional plants mainly clustered: pedicels 2–3 mm. long, slender, suberect to spreading, pilose with mostly appressed hairs; calyx somewhat deltoid and depressed-globose, broadest near the base, 2.3–2.6 mm. broad, 2–2.2 mm. long, evenly subappressed-pilose; interior sepals ovate, about as broad as long, strongly keeled; exterior sepals usually exceeding the interior, 2–3.5 mm. long, linear and abruptly acute, subappressed-pilose: capsule depressed-globose, broadest toward the base, 2–2.3 mm. broad, not more than 2 mm. long; valves ovate, with 2 slight longitudinal ridges, one on each side

of the median line, marking the position of the enclosed seed; placentae and dissepiments persistent, fragile, retaining their position and structure in the mature capsule: seeds usually 6, occasionally 4, brown, smooth, with embryo not evident, uniformly rounded, dorsally angled, ventrally with one nearly flat lateral face (that next the contiguous seed), the other side (toward the dissepiment) convex.—Bull. Torr. Bot. Cl. xxi. 252 (1894); Grosser in Engler, Pflanzenr. iv[193]. 139 (1903), *Helianthemum tripetalum* Moç. & Sess. in Dunal in DC. Prodr. i. 284 (1824). *Lechea Skinneri* Benth. Bot. Sulph. Voy. 66 (1844); Walp. Rep. Bot. v. 58 (1845–46); Hemsley in Biol. Centr. Am. i. 46 (Sept., 1879); C. Conzatti, Los Géneros Veg. Mex. 85 (1903). *L. depressa* Jones, Contrib. West. Bot. no. 18: 59 (1933).—Oklahoma (one station, Pawhuska); north-central Mexico and southern Baja California, south through the mountains of central and southwestern Mexico to Guatemala, mainly at high altitudes (600–2600 m.). OKLAHOMA: on dry rocky ledges, near Pawhuska, Osage Co., *G. W. Stevens*, no. 2004 (NY). SAN LUIS POTOSI: 6000–8000 ft., 1878, *Parry & Palmer*, no. 31; in montibus San Rafael, *Schaffner*, no. 604. GUANAJUATO: hillsides near Acambaro, *Pringle*, no. 11,923. JALISCO: thin gravelly soil of hills, near Guadalajara, *Pringle*, no. 4476; Rio Blanco, near Guadalajara, *Pringle*, no. 5171. MICHOACAN: vicinity of Morelia, Loma Sta. Maria, alt. 2000 m., *G. Arsène*, no. 7354 (as *L. Drummondii*); Loma Sta. Maria, alt. 2000 m., *Arsène*, no. 8584 (US) (as *L. Drummondii*); Loma Sta. Maria, alt. 2000 m., *Arsène*, no. 5973 (Mo) (as *L. Drummondii*); Jesus del Monte, Morelia, alt. 1910 m., *Arsène*, no. 3181 (US); Cerro San Miguel, vicinity of Morelia, alt. 2100 m., *Arsène*, no. 10,115 (US). PUEBLA: dry ground (alta Luz), Puebla, *Purpus*, no. 2744. OAXACA: Sierra de San Felipe, alt. between 7000 and 8000 ft., *C. L. Smith*, no. 814 (NY); alt. 1750 m., *Conzatti & Gonzalez*, no. 1014 (US); Combre de Taha, 1841–1843, *Liebmann*, no. 3151 (US). BAJA CALIFORNIA: La Chuparesa, *Brandegee*, no. 16; Sierra San Francisquito, December 1, 1899, *Brandegee* (NY); the Laguna, Laguna Mountains, *M. E. Jones*, no. 27,117 (as *L. depressa*, n. sp.). GUATEMALA: September, 1921, *Tonduz*, no. 612 (NY); Traderas Aridas (de Guatemala), 1400 m. alt., July, 1931, *Tonduz*, no. 612 (US). PLATE 489, FIG. 11; MAP 7.

The plate of Moçino and Sesse[1] to which Dunal refers in his description[2] is without doubt a *Lechea*. The long narrow exterior sepals serve to identify it with what has usually been called *L. Skinneri* Benth. The only other Mexican species in the genus, *L. villosa* var. *Schaffneri*, has lanceolate leaves and is decidedly more densely branched and strict than is the plant in the illustration. *L. depressa* Jones is a somewhat depauperate semiprostrate plant which in all essential characters is like *L. tripetala*.

[1] Moçino & Sesse, Fl. Mex. Ic. (ined.)
[2] DC. Prodr. i. 284 (1824).

Lechea tripetala has been confused to a certain extent with *L. san-sabeana* which it resembles in size and shape of calyx, exterior sepals and capsule, length of pedicel and arrangement of fruits. This is usually secund in *L. tripetala* and always so in *L. san-sabeana.* Certain differences are equally well marked. The branching is dense in the former, sparse in the latter. The caudex, which is extensive and often decumbent in *L. tripetala,* is erect and but slightly if at all branched in *L. san-sabeana.* The pendulous fruits of the latter, which are borne on very slender pedicels 3 or more mm. long, and the persistent and firm yellow placentae and dissepiments, which partition off and partly inclose the two seeds opposite each valve, make *L. san-sabeana* utterly distinct from all others. *L. tripetala,* its closest relative, has long, often spreading pedicels and pale-red dissepiments which, though fragile, are definite and persistent structures. *L. san-sabeana* is confined to low altitudes in eastern and southeastern Texas. *L. tripetala,* except for the extraordinary occurrence at one station in Oklahoma, is found only from San Luis Potosi and southern Baja California southward into Guatemala. Many, if not all of these Mexican and Central American stations, are at altitudes of 1000 meters or more as indicated on the labels.

Lechea tripetala, with 6 (occasionally 4) seeds, is closely related to the variety *occidentalis* of *L. tenuifolia,* which has 2 seeds and smaller fruits on less spreading branches. *L. tenuifolia* and its western variety *occidentalis, L. mensalis* of western Texas, *L. tripetala,* mostly of Mexico, and *L. san-sabeana,* confined to areas of low altitude in Texas, constitute a well-marked division of the genus, uniformly characterized by having narrow cauline leaves and narrow basal leaves (when present), the exterior sepals longer than the interior and the capsule and calyx either depressed-globose and broadest near the base or, if elongated, with the basal part broader than the upper half. The pedicels are mostly as long as or much longer than the mature calyces and the flowers and fruits are loosely racemose along the branches (not crowded at the tip). The presence of *L. tripetala* in three widely separated areas, Oklahoma, Baja California and the mountains of central and southern Mexico and of Guatemala, indicates an early origin and spread followed by a later decline, leaving widely separated stations to mark its once considerable range and abundance. Johnston,[1] p. 966, in a discussion of the *Relationship and Origins of the Biota*

[1] Proc. Cal. Acad. Sci. xii. 966–969 (1924).

of Lower California, where *L. tripetala* is found, states of the Peninsula, "the southern two thirds has a flora clearly and definitely allied to and derived from the flora now occupying Sinaloa, southern Sonora, and the states of southern Mexico." The area mainly occupied by *L. tripetala* on the Peninsula is the Cape region of which Johnston says, l. c. pp. 968, 969. "The cape region seems to be a very old area, and appears to have escaped complete submergence since its initial elevation early in the Tertiary. During the long periods previous to the Pliocene the cape region was separated from California by a long stretch of water, for at that time the strata of the present volcanic plateau were horizontal and still under the sea. The cape region of Tertiary times was probably a larger area than now and connected for a time with the Mexican mainland. While joined easterly to the Mexican coast, the fauna and flora of that region gained access to the cape region. Among many other species the ancestors of the southerly derived reptiles, the Oryzomys, and the heavy-seeded montane trees, such as Pinus, Quercus, and Arbutus, came over on the Tertiary land connection." In matters of distribution *Lechea* probably belongs in the same category as the heavy-seeded montane trees. Its seeds, though small, are solid and perfectly smooth and therefore not adapted to wind-dissemination. Their smallness (1 mm. long) and probable scarcity make it seem unlikely that seed-eating birds have carried the species to Baja California. Its capsules are similarly not adapted to popularly conceived notions of dissemination. A land-connection would, I believe, be necessary to bring about this distribution. The presence of the plant toward the north in the Sierra San Francisquito might perhaps be explained by a later migration northward when land-connections in that direction were subsequently resumed. It seems more plausible to me to assume that here again is an instance of an area included in the early range of the species. Grabau[1] shows a land connection to have been present in Eocene time between the cape region of Lower California and the mainland of Mexico, a connection which was severed in Oligocene time. The intruding seas of that period have persisted to present time.

The tremendous "jump" of the species to the northeastern part of Oklahoma recalls the significant fact that the Ozark plateau, as noted by Fernald[2] and by Steyermark,[3] has been in continuous existence as

[1] Textbook of Geology, part 2: 801, fig. 1835 (1921).

[2] *Specific Segregations and Identities in some Floras of Eastern North America and he Old World.* Rhodora, xxxiii. 25–27 (1931).

[3] Rhodora, xxxvi. 231–233 (1934).

a land-area since the close of the Paleozoic era. Speaking of those ancient species which are restricted to the Ozark Plateau and to the adjacent area to the west and southwest, Steyermark, p. 231, states, "In some instances species originating in this area are represented slightly to the east or southeast of the main area, but have spread mostly westward and southwestward; some of this class are found as far south as the Mexican plateau or as far west as Arizona." Comparing this class with that comprising the species common to the southern Appalachians, Steyermark, p. 233, concludes that it is "a younger flora, characteristic of the uplands and barrens of the Ozarks, a flora which probably originated in Tertiary times when this region was re-elevated in late Tertiary."

Though Steyermark places the time of establishment of this class of species in the Ozark area as late Tertiary, it seems to me that, in view of the general disruption in range of *L. tripetala* and its extreme isolation in Oklahoma, it and perhaps other species mentioned by Steyermark as occurring on both the Ozark and the Mexican plateaus may well have attained their present limits of distribution in earlier Tertiary times.

(*To be continued*)

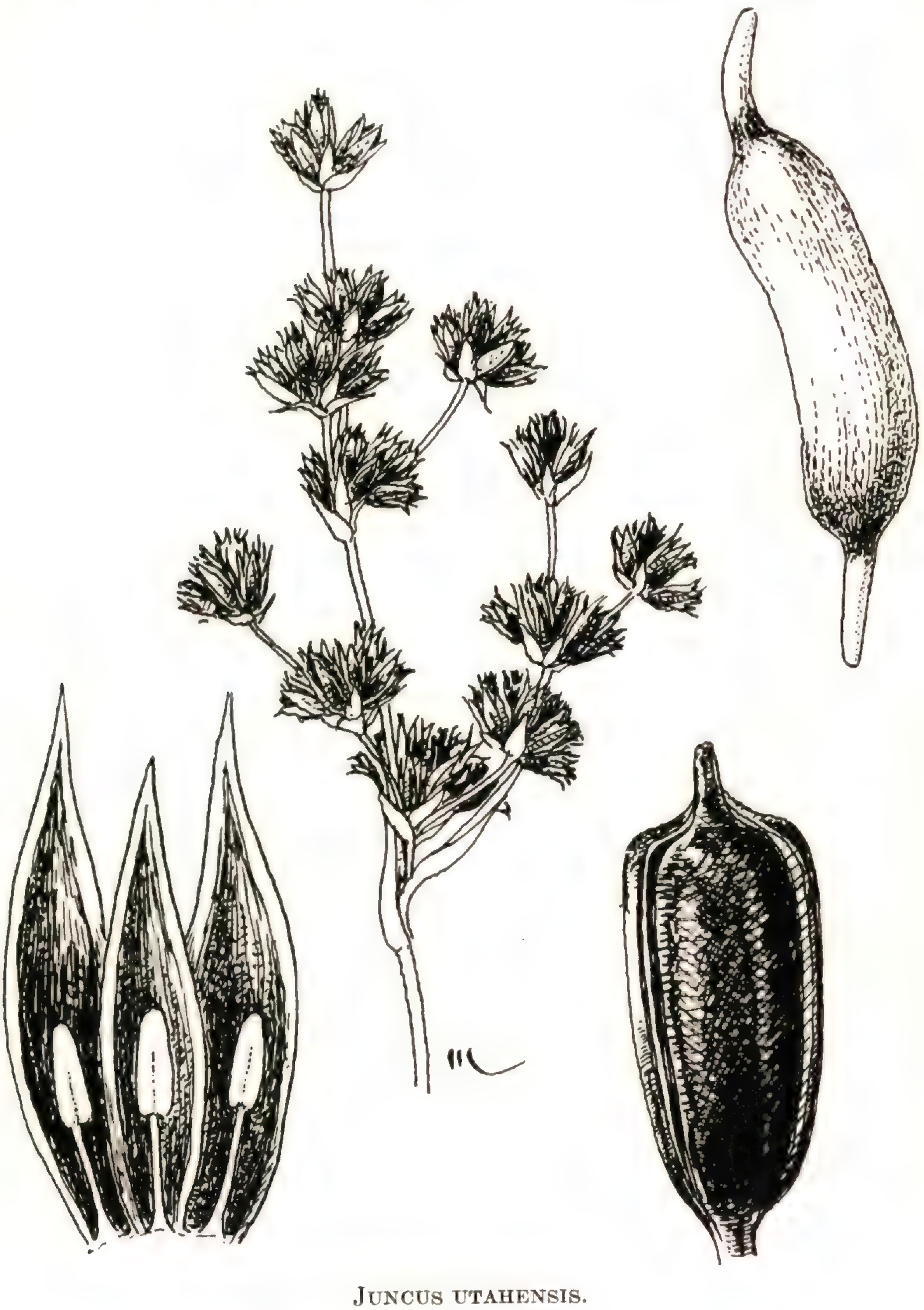
A NEW JUNCUS FROM UTAH

Robert F. Martin

Juncus **utahensis**, sp. nov. Perennis; caules ex rhizomate horizontale, 25–35 cm. alti; folia septata, compressa; inflorescentia 15–30-glomerulata; glomeruli 4–7-flores; sepala 4 mm. longa, lanceolata, subacuminata, saturate brunnea, petalis paulo longiora; petala lanceolata, acuta, saturate brunnea; stamina 6, sepalis duplo breviora; filamentum antheraque subaequalia; fructus saturate brunneus, mucronatus, obtusus, sepalis aequalis; semina caudata.

Perennial; stems arising singly or few together from a horizontal rootstock, 25–35 cm. high; sheaths with scarious margins: blades up to 18 cm. long, compressed, septate; inflorescence rather congested, of 15–30 clusters of 4–7 flowers; bracts and bracteoles light brown; sepals 4 mm. long, lanceolate, short–acuminate, chocolate–brown, a little longer than the lanceolate, similarly colored acute petals; stamens 6, about one-half the length of the sepals; filament and anther about the same length, the filament narrower; capsule oblong, blunt below the mucronation, chocolate–brown, about the length of the sepals; seeds white-tailed, light reddish–brown, striate, 0.8 mm. long.

TYPE in the U. S. National Herbarium, no. 1684014 collected by *A. G. Nord and E. Fred Sargent* (no. 1), September 10, 1927, in a



JUNCUS UTAHENSIS.

meadow at 8,700 feet, Ashley National Forest, Summit County, UTAH. Also represented in the Herbarium of the Forest Service by *Hutchings* no. 204 from the same county.

Juncus utahensis resembles species of the *Ensifolii* group. Distinction is made as follows:

Stamens 3	*J. ensifolius* Wiks.
Stamens 6	
Seeds white-tailed	*J. utahensis* Martin
Seeds only apiculate	*J. xiphioides* Meyer
	J. brunnescens Rydb.
	J. saximontanus A. Nels.

Juncus utahensis may be distinguished from *J. nevadensis* S. Wats. by the acute capsule and subterete leaf-blades of the latter species.

Mr. B. Y. Morrison, of the Bureau of Plant Industry, has kindly executed the accompanying illustration.

Bureau of Plant Industry, Washington

TWO UNDESCRIBED PLANTS FROM ARKANSAS

Julian A. Steyermark

Echinacea purpurea (L.) Moench, var. **arkansana** var. nov., foliis caulinis 3.5–6 cm. longis, 1–1.5 cm. latis, caulibus tenuibus; capitulis 1–1.2 cm. altis, 1.2–1.5 cm. latis; paleis apicibus longis spinosis terminatis, 10–11 mm. longis; ligulis 2.5–3 cm. longis; acheniis 3.5 mm. longis.—Boggy Springs, Sevier Co., Arkansas, July 19, 1937, *Brinkley 259* (type in herbarium of Field Museum).

This variety is smaller in all respects than typical *Echinacea purpurea*. The contrasting set of differences may best be noted in the following table:

	Echinacea purpurea	Echinacea purpurea var. arkansana
cauline leaves	7–19 cm. long	3.5–6 cm. long
	1.5–7 cm. broad	1–1.5 cm. broad
heads	1.5–2.7 cm. high	1–1.2 cm. high
	1.1–4 cm. broad	1.2–1.5 cm. broad
rays	4–5.5 cm. long	2.5–3 cm. long
paleas	11–13 mm. long	10–11 mm. long
achenes	4–4.5 mm. long	3.5 mm. long
stems	stout	slender

Clematis versicolor Small, f. **pubescens** f. nov., foliis infra dense puberulis.—Boggy Springs, Sevier Co., Arkansas, July 24, 1937, *Brinkley 268* (type in herbarium of Field Museum).

Typical *Clematis versicolor* of southern Missouri and northern Arkansas has perfectly glabrous leaves. In the plant from Sevier Co.

the under surface of the leaves is covered with numerous fine short hairs.

Field Museum of Natural History,
Chicago, Illinois

The Relation of Pinus rigida to Physiographic Features and Soil Types in Central Massachusetts—In the summer of 1935 and 1936 while working on forest succession and soil types in Worcester County, Massachusetts, the writer noticed that *Pinus rigida* Mill., was often found and predominantly so, on certain sandy soils.

In the summer of 1937, I carefully checked the occurrence of pitch pine throughout the 1522 square miles of Worcester County and found that it occurred predominantly (almost exclusively) on soils of the Merrimac and Hinckley series. Occasionally, however, *Pinus rigida* is found on soils of other series, but when this occurs, the trees are found singly in open pastures, to the leeward of dense stands upon the above named soils. The seeds having been carried there by the prevailing wind and there being little competition the pines flourished.

The Merrimac and Hinckley soils are water-lain soils characterized by their relatively high content of sands and gravels. The former soils are found only on terraces, whereas the latter are found on kame terraces, kames,[1] eskers[2] and outwash[3]—all stratified deposits of the glacial period. These sterile sandy physically dry soils are ideal for drought-resisting pitch pine.

The following table contains a mechanical analysis of a Merrimac soil. It is apparent that the soil is excellently drained because of the high percentage of fine gravel, coarse, medium and fine sand, while the percentage of very fine sand, silt and clay—the water-retaining textures—is very low.

Mechanical Analysis of Merrimac Loamy Coarse Sand.

Horizon	f.g.	c.s.	m.s.	f.s.	v.f.s.	silt	clay
0–4 inches.	13.2	37.0	13.0	18.4	4.5	8.4	6.2
4–6 "	18.6	36.5	11.6	16.4	5.1	7.6	4.8
6–20 "	20.3	38.9	12.0	15.0	3.8	7.0	3.4
20–36 "	30.1	35.4	11.5	16.0	2.6	3.5	1.3

[1] Kames—stratified sandy or gravelly hummocks.

[2] Eskers—irregular ridges of stratified drift.

[3] Outwash—alluvial fan-like plains formed in front of retreating ice during the glacial period.

The above observation indicates that the value of herbarium specimens would be greatly enhanced if the exact location, as to soil type and series, could be included with other data on the labels of all plants collected in states where detailed soil surveys have been completed. The collector would, then, not only be contributing data of systematic importance but would also contribute to future research of ecologic importance.—William B. Brierly, George Washington University.

The Occurrence of Poa Chaixii in America.—*Poa Chaixii* Villars was collected by the writer in Duluth, Minnesota, on June 26, 1937. This collection is of interest because, according to Mrs. Agnes Chase, it is the first one of this species in America. Mrs. Chase reports that the grass is frequent in woodlands of western and central Europe. There are specimens in the United States National Herbarium from practically all the countries within the specified area. In the Herbarium of University of Minnesota there are specimens from Sweden and Finland.

The determination was first verified by Dr. C. O. Rosendahl, University of Minnesota, and later by Mrs. Agnes Chase and Mr. J. R. Swallen, United States National Herbarium. Moreover, Mrs. Chase furnished the following reference: "*Poa Chaixii* Villars, Flora Delphinalis 7. 1785. '—in sylvis & pratis alpestribus circa Chaudun . . .' Named for Abbé Dominique Chaix, 1730–1799."

Several varieties of *Poa Chaixii* Vill. have been described. Mrs. Chase concludes that the Duluth specimen is the "species itself" and is "very like one from the Bois de Boulogne, near Paris."

Poa Chaixii Vill. grows in Duluth on Hunter's Hill which slopes to the residential district of Hunter's Park. At the base of the south-facing slope winds a stream. The hill is a ridge-like formation with bare cliffs of basalt on the south and northeast sides. A trail, used by occasional hikers, leads to the south cliff over 1200 feet above the sea level, and follows the southeast slope through the woods to the street level. A transition forest covers the hill. In the *Tilia-Acer* association grow several species of deciduous trees characteristic of the region. Toward the base of the slopes are scattered stands of *Pinus Strobus, Picea canadensis,* and *Abies balsamea. Dirca palustris, Acer spicatum,* and *Taxus canadensis* are representative among the native shrubs. The ground flora is rich and varied in native species. On

the steep and densely overgrown southeast slope, *Poa Chaixii* is well established and abundant, in places dominating the other types of vegetation. With it occurs *Milium effusum;* among the species of grasses in the woods may be mentioned *Dactylis glomerata* and *Poa nemoralis*, as very common.

The duplicate collections are deposited in the Herbarium of University of Minnesota.—Olga Lakela, State Teachers College, Duluth, Minnesota.

Cyperus pilosus Vahl in the United States.—This species, a native of Asia, tropical Australia and rarely west Africa was collected by the author in a roadside ditch in a pineland (*Pinus Taeda* L.) south of Ponchatoula, Tangipahoa County, Louisiana, August 17, 1936 (sheet number 9008). As it is a common weed in the rice-fields of the Orient, it is not surprising that it turned up in this country. The plant was growing in a colony about a hundred feet long and was represented by several hundred culms. Duplicate sheets of this collection will be sent to the Gray Herbarium, United States National Herbarium and the University of Michigan.—Hugh O'Neill.

SOME MYXOPHYCEAE FROM NANTUCKET ISLAND, MASSACHUSETTS[1]

Francis Drouet

On August 21–22, 1937, I had the great pleasure of visiting and collecting algae with Mr. B. F. D. Runk on Nantucket Island. The collections obtained at that time, together with a few other specimens obligingly contributed by the collectors or seen in herbaria, are the only ones which have come to my attention as representing the blue-green algal flora of the island. Of previous reports of Myxophyceae, I find only a list of 11 species determined by F. S. Collins and included in M. L. Owen's *Catalogue of the Plants of the County of Nantucket, Mass.*, pp. 76–77 (Northampton, 1888). The specimens upon which these reports were based are yet to be searched for; it is certain that they do not exist in the larger accumulations of the Collins material in the New York Botanical Garden and the Farlow Herbarium. Literature relating to the physiography and vegetation of Nantucket has recently been reviewed or listed by E. F. Guba in Rhodora **39:**

[1] Contribution from the Osborn Botanical Laboratory of Yale University and from the Department of Botany, Marine Biological Laboratory.

367ff (1937). In the list below, herbaria in which specimens are cited are indicated by the following abbreviations: D, my personal herbarium; F, Farlow Herbarium of Harvard University; N, New York Botanical Garden; Nan, Herbarium of the Maria Mitchell Association, Nantucket; S, Naturhistoriska Riksmuseet, Stockholm; T, Herbarium of Wm. Randolph Taylor; Y, Herbarium of Yale University.

CALOTHRIX CRUSTACEA Thur. ex Born. & Flah., Ann. Sci. nat. VII Bot. **3**: 360 (1886).—Reported in Collins' list (see above) from Brant Point and Polpis. One specimen seen: on pilings, Hither Creek, Madaket, *C. M. Palmer*, 15 Aug. 1937 (D).

NOSTOC MUSCORUM Ag. ex Born. & Flah., ibid. **7**: 200 (1888).—See Allison, Bot. Gaz. **98**: 433ff (1937), for notes on the life history and physiology of this species. One collection: on wet sand along margins of Hummock Pond, *Drouet 2150* (D, F, N, Nan, S. T, Y).

NODULARIA SPUMIGENA var. GENUINA Born. & Flah., ibid. **7**: 246 (1888).—One collection: in plankton, Sesachacha Pond, *W. R. Taylor 3084*, 29 July 1920 (T, D).

FREMYELLA GRISEA (Thur. ex Born. & Flah.) J. DeToni *pro synon.*, Noterelle di nomencl. algolog. VIII. Terzo elenco di Missoficee omonime (Brescia, 1936). *Microchaete grisea* Thur. ex Born. & Flah., ibid. **5**: 84 (1887).—Not frequently reported from North America. The three collections come from the pilings of a wharf in Hither Creek, Madaket: *B. F. D. Runk*, 15 Aug. 1937 (D), 30 Aug. 1937 (D, F, N, S); *Drouet 2153* (D, Nan, T, Y).

SCYTONEMA CINCINNATUM (Kütz.) Thur. ex Born. & Flah., ibid. **5**: 89 (1887). *S. crispum* (Ag.) Born. *pro synon.*, Bull. Soc. Bot. France **36**: 157 (1889).—Specimens seen: Hummock Pond, *D. G. More*, Aug. 1910 (Nan), *W. R. Taylor 3088*, 31 July 1920 (T, D); north end of Long Pond, *Drouet 2164* (D, F, Nan); in a small pond, *J. Schramm*, 15 Aug. 1909 (Phyc. Bor.-Amer. 1613, N, T).

HYDROCOLEUM GLUTINOSUM (Ag.) Gom., Ann. Sci. nat. VII Bot. **15**: 339 (1892).—One collection: on wet sand, margins of Hummock Pond, *Drouet 2149* (D, F, Nan, S).

LYNGBYA AESTUARII (Mert.) Liebm. ex Gom., ibid. **16**: 127, pl. iii, fig. 1 & 2 (1892).—Reported in Collins' list from 'marshes.' One collection seen: with and sub. nom. *Oscillatoria nigro-viridis*, on muddy shore of Sheep Pond, *Drouet 2144* (D, F, Nan, S).

PHORMIDIUM LURIDUM (Kütz.) Gom., ibid. **16**: 165, pl. iv. fig. 17 & 18 (1892).—Common here in drinking fountains. Specimens seen: in fountain by road at Our Island Home, *Drouet 2157* (D, N, Nan, S); lower basin of fountain on Lieut. Max Wagner Square, Nantucket, *Runk & Drouet 2159* (D, Nan, S, T, Y); Abiah Folger Franklin Memorial Fountain, Nantucket, *B. F. D. Runk*, 15 Aug. 1937 (D), *Runk & Drouet 2151* (D, F, N, Nan, S).

PHORMIDIUM AUTUMNALE (Ag.) Gom., ibid. **16**: 187, pl. v, fig. 23 & 24. *Lyngbya hahatonkensis* Drouet, Bot. Gaz. **95**: 698, fig. 5 (1934).—

In subaerial habitats: on sides of lower basin, Abiah Folger Franklin Memorial Fountain, Nantucket, *M. Travis & Drouet 2152* (D, Nan); on sides of platform of Island Service Company ice-house, Nantucket, *Drouet 2156* (D, F, Nan, S).

Oscillatoria nigro-viridis Thw. ex Gom., ibid. **16:** 217, pl. vi, fig. 20 (1892).—Probably *O. limosa* var. *chalybea* of Collins' list. Specimens seen: on muddy shore of Sheep Pond, *Drouet 2144* (D, F, Nan, S).

Oscillatoria brevis Kütz. ex Gom., ibid. **16:** 229, pl. vii, fig. 14 (1892).—Seen in one collection: with *Hormidium* sp. on bank of Long Pond beneath bridge on Madaket Road, *Drouet 2163* (D, F, N, Nan, S, T).

Spirulina subsalsa Oerst. ex Gom., ibid. **16:** 253, pl. vii, fig. 32 (1892).—Probably *S. tenuissima* of Collins' list. One collection seen: with and sub. nom. *Oscillatoria nigro-viridis*, on muddy shore of Sheep Pond, Drouet 2144 (D, F, Nan, S).

Osborn Botanical Laboratory of Yale University and
Department of Botany, Marine Biological Laboratory

Wolffiella floridana in Massachusetts.—Last July I noticed a small but abundant aquatic in a pond formed at the confluence of Beaver Dam and Pole Brooks in the southwest part of Lincoln, Massachusetts. Specimens were collected August 1 and submitted, through Miss Bernice G. Schubert, to Dr. W. H. Camp of the New York Botanical Garden, who identified them as *Wolffiella floridana* (J. D. Smith) Thompson. Prof. M. L. Fernald informs me that the nearest station is in New Jersey.

The plant occurs in rather dense mats, up to three inches thick, floating beneath the surface film and usually almost concealed by a layer of *Lemna*. These mats are almost restricted to small, very sheltered bays which are nearly cut off from the main body of water by partly submerged logs or the overhanging stems of *Cephalanthus*.

The pond is not shown on any map I have seen and may have been formed rather recently in reconstructing Route 117. It is about one half mile long and one tenth mile wide. Its outflow is into the Sudbury River.

In conclusion, I tender my hearty thanks to the kind botanical friends who have so freely assisted me with this plant.—Charles H. Blake, Massachusetts Institute of Technology, Cambridge, Mass.

Volume 40, no. 469, including pages 1–28, was issued 8 January, 1938.

MAR 8 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. March, 1938. No. 471.

CONTENTS:

New or otherwise Interesting Plants from Indiana.
Frederick J. Hermann 77

A Taxonomic Study of Lechea (concluded). *Albion R. Hodgdon*.. 87

Validation of Combinations in Palmer and Steyermark's Annotated Catalogue of the Flowering Plants of Missouri.
Julian A. Steyermark 131

Rare Plants in Michigan. *O. A. Farwell* 134

Euphorbia dentata and Salsola collina in Minnesota.
John W. Moore 135

Three Transfers. *Louis C. Wheeler* 136

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

H pl. 49?-9?

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **March, 1938.** **No. 471.**

NEW OR OTHERWISE INTERESTING PLANTS FROM INDIANA[1]

FREDERICK J. HERMANN

DURING the preparation of the treatments of *Carex* and the Juncaceae for Deam's *Flora of Indiana* a number of new forms and of species not heretofore reported for the state have turned up and it has been found necessary to make several new combinations. It seems advisable to record these, together with a few novelties in other genera, as a group.

The following abbreviations for herbaria are used:

B—Bailey Hortorium.
Brk—Brooklyn Botanic Garden.
CA—California Academy of Sciences.
D—C. C. Deam, Bluffton, Ind.
Ek—C. M. Ek, Kokomo, Ind.
F—Field Museum.
G—Gray Herbarium.
H—F. J. Hermann, Ann Arbor, Mich.
K—R. M. Kriebel, Bedford, Ind.
M—University of Michigan.
McK—Madge McKee, Goodland, Ind.
N—U. S. National Herbarium.
ND—Notre Dame University.
NY—New York Botanical Garden.
P—Philadelphia Academy of Natural Sciences.
W—University of Wisconsin.

SCIRPUS ATROVIRENS Muhl., forma **proliferus**, forma nov. Spiculae nonnulae gemmis foliosis (1–5 cm. longis) basi bulbiformibus.—INDIANA: boggy slope on high bank of Little Vermillion River about 3 miles west of Newport, Vermillion County, *C. C. Deam*, no. 53,161, Sept. 19, 1932 (G—TYPE). MICHIGAN: marshy border of low woods, Cady's Corner, 5 miles southwest of Ypsilanti, Washtenaw County, *F. J. Hermann*, no. 8402, Sept. 29, 1936 (H; M; NY; P).

A similar form of *S. atrovirens* var. *georgianus* has been described by Marie-Victorin.[2]

[1] Paper from the Department of Botany of the University of Michigan no. 578 Printed at the expense of the Department to insure prompt publication.

[2] Contrib. Lab. Bot. Univ. Montreal **15**: 267–268, f. 8. 1929.

Carex Sartwellii Dewey, var. **stenorrhyncha**, var. nov. Perigynium ellipticum, gradatim in rostrum longum attenuatum, 4–4.5 mm. longum, 1–1.3 mm. latum.—Marshy prairie east of Wolf Lake, north of Hammond, Lake County, *F. J. Hermann*, no. 6052, June 2, 1934 (G—type); in prairie marsh south of Sheffield St. and west of Calumet Ave., 2 miles north of center of Hammond, Lake County, *C. C. Deam*, no. 53,920, June 24, 1933 (D).

In typical *C. Sartwellii* the perigynia are "ovate-orbicular, 2.5–3 mm. long, 1.25–1.75 mm. wide, abruptly contracted into a serrulate beak about one-fourth the length of the body."[1] In var. *stenorrhyncha* the perigynia are very gradually long-beaked, elliptic in outline, from 4–4.5 mm. long and only 1–1.3 mm. wide.

In its long perigynia and narrow beak var. *stenorrhyncha* resembles the European *C. intermedia* Good. which Prof. Fernald informs me occurs in bogs or marshes of Ontario and Quebec. The variety of *C. Sartwellii* differs from *C. intermedia* in having the perigynia from elliptic to oblong-lanceolate or lanceolate, sessile to very short-stipitate, membranaceous, the body usually grading imperceptibly into the beak which is shallowly if at all bidentate (although strongly obliquely cut), and in having the pistillate scales largely hyaline. *C. intermedia* has ovate perigynia (1.75–2 mm. wide) which are stipitate, coriaceous and abruptly contracted into the deeply bidentate beak. The hyaline portion of the pistillate scales in *C. intermedia* is confined to a narrow margin; for the most part the scales are of a deep reddish-brown or coppery color which gives to the longer spikes of this species a shade much darker than those of the stramineous *C. Sartwellii* and its variety.

Carex mesochorea Mackenzie. In his most recent treatment of this species[2] Mackenzie apparently restricts its range to the region east of the Alleghenies. Material from seven stations in three counties of southern Indiana matches closely typical collections from New Jersey and Pennsylvania. The following collections are representative: grassy hillside 5 miles west of New Market, Montgomery County, *F. J. Hermann*, no. 6162, June 6, 1934 (CA; F; G; M; N; P) and *C. C. Deam*, no. 55,035, June 6, 1934 (D); grassy woodland near Harrodsburg, Monroe County, *R. M. Kriebel*, no. 2146, June 17, 1934 (H; K); pasture 2 miles south of Heltonville, Lawrence County, *R. M. Kriebel*, no. 3350, June 16, 1935 (K).

Carex gravida Bailey, var. Lunelliana (Mack.) Hermann (Amer. Midl. Nat. **17**: 855. 1936). Mackenzie, in *North American Flora*,

[1] Mackenzie in N. Amer. Fl. **18**: 37. 1931.
[2] Mackenzie, l. c. **18**: 51. 1931.

cites Illinois as the eastern limit of his *C. Lunelliana.* It is now known from three Indiana counties along the Illinois border: railroad siding 2 miles northwest of Earl Park, Benton County, *F. J. Hermann,* no. 6594, June 14, 1935 (Brk; CA; G; H); sandy roadside 4 miles south of Vincennes, Knox County, *C. C. Deam,* no. 56,130, June 14, 1935 (D); sandy soil 5 miles north of Terre Haute, Vigo County, *C. C. Deam,* no. 53,768, May 28, 1933 (D; H).

CAREX STIPATA Muhl., var. MAXIMA Chapm. (*C. uberior* (Mohr) Mack.) Kentucky and Missouri are given by Mackenzie as the northern limit of this sedge in the Mississippi Valley. The following Indiana collections are typical of *C. uberior:* swales, Chesterton, Porter County, *L. M. Umbach,* June 16, 1900 (D); woods ¼ mile south of Chestnut Ridge, Jackson County, *C. C. Deam,* no. 25,177, June 6, 1918 (D). Two collections (border of pond in woods 1 mile northeast of Romney, Tippecanoe County, *C. C. Deam,* no. 36,082, May 25, 1922 (D); boggy slope of terrace of Kissenger Ditch 2 miles east of Monroe, Knox County, *C. C. Deam,* no. 38,688, June 4, 1923 (D)) approach typical *C. stipata* although nearer *C. uberior,* while other intergrading forms, several of them exact intermediates, are so frequent in Indiana that it seems illogical to treat *C. uberior* as a species.

CAREX CUMULATA (Bailey) Mack. Known in Indiana only from a single collection by Miss Madge McKee: along a roadside ditch 3 miles northwest of Morocco, Newton County, July 4, 1936, no. 1743 (D) and 1744 (H; McK).

CAREX ARTITECTA Mack., var. **subtilirostris,** var. nov. Perigynii rostrum 1.75–2 mm. longum, spica mascula 11–16 mm. longa squamis haud appressis.—Wooded slope along a small creek about 3 miles northwest of Clinton, Vermillion County, *C. C. Deam,* no. 54,764, May 5, 1934 (G—TYPE; D).

Var. *subtilirostris* resembles *C. Emmonsii* Dewey in having the staminate scales ascending to loosely spreading, rather than closely appressed, and the midvein conspicuous to the tip of the scale, but the staminate spike is peduncled, longer and more conspicuous than in either *C. Emmonsii* or typical *C. artitecta.* The sheaths are more fibrillose than in the typical form and many of them purple-tinged to a length of 8 cm.; while in the typical form the coloration rarely extends more than 3 cm. above the base. The outstanding character-istic of var. *subtilirostris* is the extremely long perigynium-beak (1.75–2 mm. long, 1 mm. or less in the typical form) which often exceeds in length the body of the perigynium.

A collection from Tennessee, *J. K., Underwood,* no. 638, below Cherokee Orchard, Gatlinburg, Sevier County, April 29, 1934 (H), is tentatively referred here. It agrees well with the Indiana plant in its

long perigynium-beaks and long, conspicuous staminate spikes but the staminate scales are appressed, blunt and with shorter midrib.

Carex Woodii Dewey. The aphyllopodic culms of this species of moist woodlands amply set it off from its relatives of meadows and prairies, *C. tetanica* Schkuhr and *C. Meadii* Dewey. It has not been reported from Indiana. Moist red and white oak woods, about 4 miles northwest of Valparaiso, Porter County, *C. C. Deam*, no. 44,400, June 2, 1927 (D); rich maple-beech woods, 1½ miles southeast of North Liberty, St. Joseph County, *C. C. Deam*, no. 54,861, May 23, 1934 (D; H) and *F. J. Hermann*, no. 6567, June 13, 1935 (CA; G; H).

Carex styloflexa Buckley. A single collection from Indiana apparently represents the northwestern limit of the range of this species which has not been reported for the state: moist woods near Adams, Decatur County, *Mrs. C. C. Deam*, no. 8149, May 13, 1911 (D).

Carex laxiflora Lam., var. **serrulata,** var. nov. Bractearum vaginae serrulatae; perigynia eis varietatis typicae breviora latioraque.—Indiana: in dry woods about 3 miles south of Garrett, DeKalb County, *C. C. Deam*, no. 3032, May 17, 1908 (D); in rich dry woods about 3 miles northwest of Upland, Grant County, *C. C. Deam*, no. 15,814, May 22, 1915 (D); on a beech slope about 7 miles northeast of Bloomington, Monroe County, *C. C. Deam*, no. 35,805, May 20, 1922 (D); wooded ravine 2 miles northwest of Henryville, Clark County, *C. C. Deam*, no. 6458 (G—type). Pennsylvania: oak-maple woods bordering Tinicum Creek, 1 mile northeast of Ottsville, Bucks County, *F. J. Hermann* no. 3443, July 12, 1932 (B); maple woods bordering Tinicum Creek, 1 mile southeast of Sundale, Bucks County, *F. J. Hermann*, no. 3487, July 12, 1932 (H).

The characters emphasized by Mackenzie for the separation of the *C. laxiflora* from the *C. blanda* group in his two latest treatments,[1] namely, the smooth bract-sheaths and the sterile culms reduced to tufts of leaves in *C. laxiflora* and its immediate allies and the ciliate-serrulate bract-sheaths and well-developed sterile culms in *C. blanda* and its allies, seem to be the most dependable yet offered for these complex groups. Of many hundreds of specimens in this series examined by the writer all have fallen readily into the categories as redefined by Mackenzie except for one repeatedly recurrent form here proposed as *C. laxiflora* var. *serrulata*. Its lack of sterile culms and merely oblique perigynium-beaks place it definitely with *C. laxiflora* but it possesses the ciliate-serrulate bract-sheaths characteristic of the *blanda* group. It resembles *C. albursina* in its broader, shorter

[1] In Small: Manual of Southeastern Flora, 198. 1933 and in N. Amer. Fl. **18**: 244–245. 1935.

perigynia and in its tendency toward truncate pistillate scales but these are generally strongly awned although occasional specimens have them merely obtuse and apiculate or even acute. It is distinguished from *C. albursina* by its smaller, narrower bracts, conspicuous staminate spikes and longer, narrower basal leaves with the margins parallel, as well as in the lack of conspicuous sterile culms.

× Carex **Deamii**, hybr. nov., *C. Shortiana* × *C. typhina*. *C. Shortianae* similis sed spicula latiora perigyniaque rostris longis.—Edge of low woods east of road dividing Sects. 17 and 18, Jefferson Twp., 2 miles southwest of Otwell, Pike County, *C. C. Deam*, no. 43,090, May 30, 1926 and no. 55,011, June 5, 1934 (D); *F. J. Hermann*, no. 6147, June 5, 1934 (D; F; G—type; H; M; N; NY; P; and others).

Sterile; with the elongate spikes of *C. Shortiana* but these broader (7–8 mm. wide, in *C. Shortiana* 4–5 mm. wide); perigynia resembling those of *C. typhina* but more compressed, their beaks 1–1.5 mm. long (in *C. Shortiana* the beaks at most 0.2 mm. long).

A single large plant, in 1934 producing 46 flowering culms, was all that could be found of this distinctive hybrid. Closely associated with it were both the parent species.

Carex retrorsa Schwein. Mackenzie does not ascribe this species to Indiana in his monograph in *North American Flora*, and there are no recent reports of its occurrence in the state. No specimens could be found to support Schneck's report for the Lower Wabash Valley, Wilson's for Hamilton County or the report for Gibson County in Coulter's Catalogue. These localities are 120 to 230 miles south of the known range of the species and the reports were almost certainly based upon misidentifications. *C. retrorsa* is known, however, from two collections from the northern border of Indiana: edge of swamp, East Chicago, Lake County, *W. S. Moffatt*, July 2, 1893 (W); near St. Mary's Academy, Notre Dame, St. Joseph County, *J. A. Nieuwland*, July 9, 1913 (ND).

Juncus Gerardi Loisel. Peattie[1] reported this rush of the salt marshes of the Atlantic Coast from Indiana Harbor, Lake County, but attempts to locate a specimen from this locality have not been successful. In 1935, however, the species was discovered to be well established on dry open ground along the Nickle Plate Railroad 4 miles east of Kokomo, Howard County, by Mr. C. M. Ek, and the following collections from this station have been distributed: *C. M. Ek*, July 20, 1935 (Ek; H; NY); *C. C. Deam*, no. 57,045, June 28, 1936 (D; H).

Juncus macer S. F. Gray, forma **anthelatus** (Wiegand), comb. nov. (*J. tenuis* var. *anthelatus* Wiegand, Bull. Torrey Bot. Club **27:** 523. 1900).

[1] Flora Ind. Dunes, 113. 1930.

This common form of the ubiquitous *J. macer* does not have, so far as the writer can detect, a geographic range distinct from that of the species, and its preference for wetter habitats than those of the species suggests that it is an ecological variant. To accord with the concept of the categories now prevalent, therefore, it would be better treated as a form.

Juncus macer S. F. Gray, forma **discretiflorus**, forma nov. F. *anthelato* similis sed inflorescentiae rami pauci- et sparsiflori, multi fere longissimi uniflorique; sepala attenuato-subulata petalis longiora; fructus sepalis plerumque dimidio brevior.—Moist hard clay soil along road 1 mile north of Belmont, Brown County, *C. C. Deam*, no. 43,472; June 18, 1926 (D); low place along the Southern Railroad about 1 mile east of Mt. Carmel [Ill.], Gibson County, *C. C. Deam*, no. 25,489 (D); base of washed beech slope about 1½ miles west of Stanford, Greene County, *C. C. Deam*, no. 26,086 (D); buttonbush swamp on top of the highest ridge of the county about two miles north of Mauckport, Harrison County, *C. C. Deam*, no. 56,381, July 13, 1935 (D; G—type); along a small creek 1 mile southeast of Kurtz, Jackson County, *C. C. Deam*, no. 38,924, June 28, 1923 (D); along a woodroad 3 miles northwest of Shoals, Martin County, *C. C. Deam*, no. 28,176, July 16, 1919 (D).

This is a tall form resembling f. *anthelatus* but it is slender, often lax, and has a more diffuse inflorescence. The ultimate branches of the inflorescence are longer, frequently up to 7 cm., the flowers few to a branch, scattered and widely separate, the sepals attenuate-subulate and generally conspicuously longer than the petals, and the capsule typically about half the length of the sepals. The presence of several to many long filiform branches bearing only a single, terminal flower is usually a prominent characteristic of the inflorescence. In f. *anthelatus* the ultimate floriferous branches are rarely over 4 cm. long, the sepals and petals are generally subequal and the capsule averages three-fourths the length of the sepals.

The specimens of f. *discretiflorus* so far seen are all from the southern third of Indiana but the plant has so much the aspect of an ecological phase that a formal rather than a varietal designation of it seems more logical.

Juncus macer S. F. Gray, f. **Williamsii** (Fernald), comb. nov. (*J. tenuis* var. *Williamsii* Fernald, Rhodora **3**: 60. 1901).—Marshes near Calumet River, Whiting, Lake County, *F. W. Johnson*, no. 1413, July 21, 1913 (F); path north of North Twin Lake, 2 miles west of Howe, Lagrange County, *C. C. Deam*, no. 54,422, Aug. 27, 1933 (D); in meadow and along ditch, 1 mile north of Mitchell, Lawrence

County, *R. M. Kriebel*, no. 3449, June 26, 1935 (K); Newton County, *Madge McKee* in 1935 (McK).

The accumulation of numerous specimens since the original description of *J. tenuis* var. *Williamsii* was published reveals that it is not confined to the eastern states as was then supposed. Material from practically all of the central states has been seen and apparently, like f. *anthelatus*, it is to be found sporadically throughout most of the range of the species so may appropriately be treated as a form.

JUNCUS SECUNDUS Beauv. This eastern species was reported for Putnam County by Wilson[1] but a search for specimens to substantiate his report has been unsuccessful and since other species of §Poiophylli are frequently confused with *J. secundus* this record is open to question. The species is now definitely known, however, from Washington County: wet clay fallow field 3 miles east of Livonia, *F. J. Hermann*, no. 6705, June 17, 1935 (D; G; H).

LUZULA CAMPESTRIS VAR. MULTIFLORA AND ITS ALLIES.—All material of this group of *Luzula* in Indiana herbaria was found to be referred to either *L. campestris* var. *multiflora* or *L. campestris* var. *bulbosa*. This disposition of the collections resulted in a patently heterogenous grouping, and even after a series from the southern counties, clearly matching authentic material from the coastal plain of var. *echinata*, had been removed the remaining alignment was but little improved. Earlier field studies of vars. *multiflora* and *echinata* in Pennsylvania and New Jersey, where their ranges overlap, had suggested that vegetative and other gross morphologic distinctions between the two had not been sufficiently emphasized and that they were perhaps after all specifically distinct; indeed, no transitional forms between mature fruiting plants of the two could be found in the field. Further work in the herbarium strengthened this view, and a careful comparison of American and European specimens of var. *multiflora* with the rhizomatous *L. campestris* of Europe led the writer to agree with Lange,[1] Lindman,[2] Holm,[3] Vierhapper[4] and other authors that *L. multiflora* is a specific entity. With both *L. echinata* and *L. multiflora* considered as species, and with forms of var. *bulbosa* approaching *L. multiflora* the Indiana problem became less complex. Still the widespread plant of central and southern Indiana could not be made to key out to any of the varieties in Fernald and Wiegand's

[1] Conspect. Fl. Groenl. 125. 1880.
[2] Svensk Fanerogamflora, 157. 1918.
[3] RHODORA **28**: 133–135. 1926.
[4] In Engler: Pflanzenfam. **15a**: 224. 1930.

revision of the group.[1] Its affinities were manifestly with *L. echinata*, with which it frequently intergrades, and it is here proposed as an inland variety of the coastal plain species. With this alignment all the Indiana material seems to fall naturally into four groups and their distribution within the state (maps 1–4) assumes definite geographic significance. The following key is an attempt to indicate the principal characters upon which the two species and their varieties, as they occur in Indiana, may be separated.

Rays of umbel erect or ascending, relatively stout; heads mostly cylindric
  Cauline leaves large, 9 (7)–14 cm. long, 4–6 (9) mm. wide; filaments equaling the anthers; perianth averaging 3 mm. long, usually slightly exceeding the capsule; heads pale; bulbs rarely present ..... *L. multiflora.*
  Cauline leaves small, 3–5.5 cm. long, 2–3 mm. wide; filaments shorter than the anthers; perianth averaging 2.5 mm. long, shorter than the capsule; heads dark; bulbs usually present ..... *L. multiflora* var. *bulbosa.*
Rays of umbel mostly strongly divergent, some elongate and filiform; heads hemispheric or short-cylindric; leaves mostly clustered at base of plant, the cauline small, 2–7 cm. long, 1.5–3 mm. wide.
  Filaments one-half the length of the anthers or less; perianth conspicuously exceeding the capsule, generally 3 mm. or more long ..... *L. echinata.*
  Filaments more than one-half the length of the anthers; perianth from shorter than to slightly exceeding the capsule, generally about 2.5 mm. long ..... *L. echinata* var. *mesochorea.*

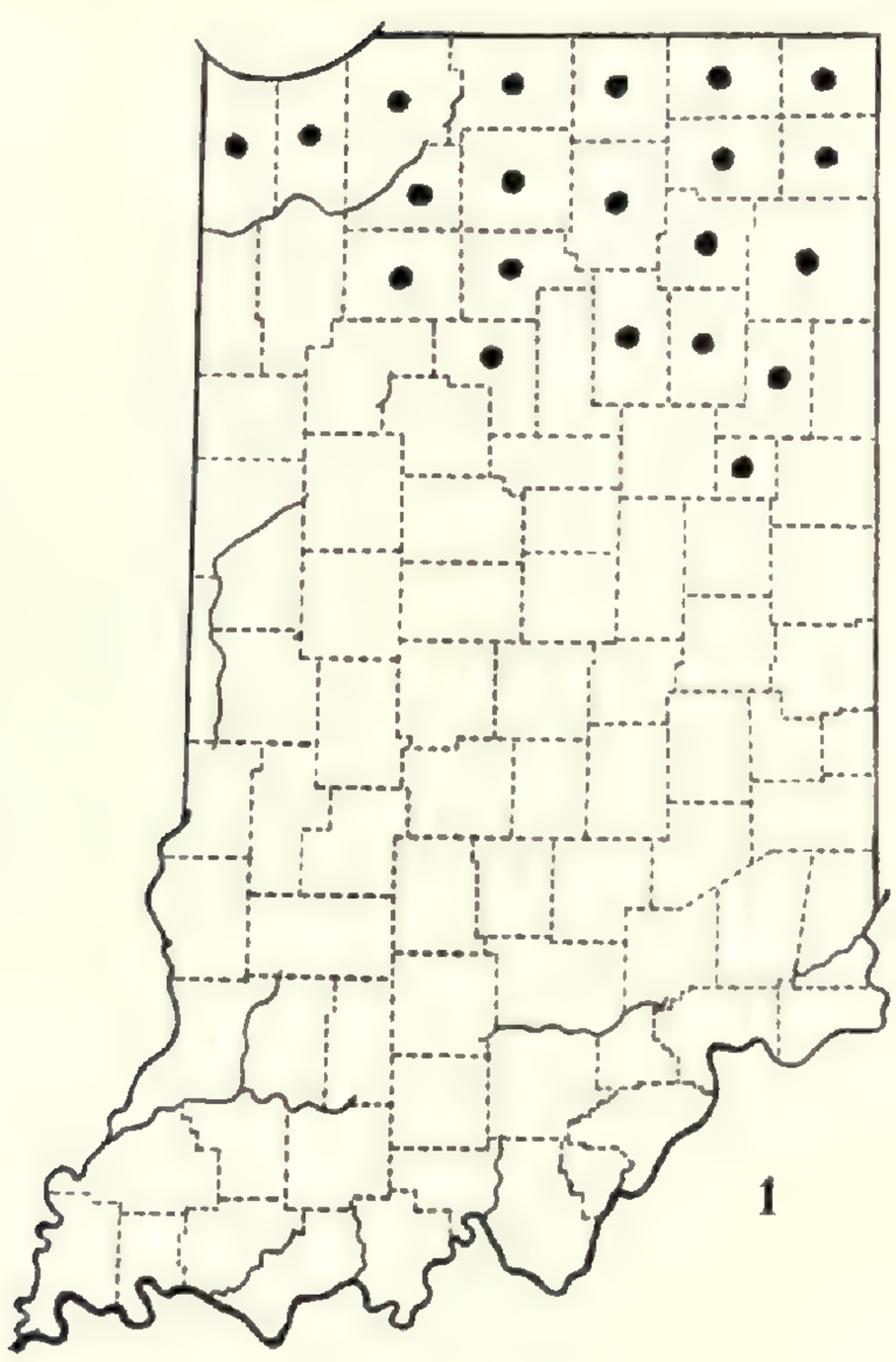
Luzula multiflora (Ehrh.) Lejeune. (*L. campestris* var. *multiflora* (Ehrh.) Čelak.). In Indiana confined to the lake area. Chiefly in clayey or gravelly soils.

Luzula multiflora (Ehrh.) Lejeune, var. **bulbosa** (Wood), comb. nov. (*L. campestris* var. *bulbosa* Wood, Class Book, 723. 1861). Represented only from the northwestern counties, all within the lake or prairies areas, where its habitat, very sandy open oak woods, is common.

Luzula **echinata** (Small), comb. nov. (*Juncoides echinatum* Small in Torreya **1**: 74. 1901). Confined to approximately the southern third of the state; most frequent in the "knob" area.

Luzula echinata (Small) Hermann, var. **mesochorea**, var. nov. Filamenta antheris ca. ⅓ breviora; sepala petalaque fructu aut breviora aut vix longiora, plerumque 2.5 mm. longa.—Dry open woods, especially white oak, throughout Indiana except in the lake area; doubtless occurring also in at least Ohio, Kentucky and Illinois. The following are among the 54 Indiana collections which were examined. Beech-tulip tree woods, 7 miles south of Columbus, Bartholomew County, *C. C. Deam*, no. 23,162, May 27, 1917 (D); dry woods about 1

[1] Rhodora **15**: 40. 1913.



Distribution in Indiana of (1) LUZULA MULTIFLORA, (2) L. MULTIFLORA var. BULBOSA, (3) L. ECHINATA, (4) L. ECHINATA var. MESOCHOREA.

mile south of Hamburg, Brown County, *C. C. Deam*, no. 6576, June 5, 1910 (G—TYPE); black-white oak woods, 2½ miles southeast of Lake Cicott, Cass County, *C. C. Deam*, no. 54,795, May 11, 1934 (D; H); black-white oak woods ½ mile west of Epsom, Daviess County, *C. C. Deam*, no. 42,825, May 19, 1926 (H); white oak woods 3¼ miles south of Weisburg, Dearborn County, *C. C. Deam*, no. 27,844, May 19, 1919 (D); dry white oak woods about 5 miles northwest of Upland, Grant County, *C. C. Deam*, no. 15,781, May 22, 1915 (D); oak knob, 1½ miles southwest of Heltonville, Lawrence County, *F. J. Hermann*, no. 6160, June 5, 1934 (G; H); common on a beech slope about 6 miles northeast of Bloomington, Monroe County, *C. C. Deam*, no. 44,005, April 17, 1927 (D); woods 7.7 miles east of the Spencer-Perry County line, north side of road 62, Perry County, *R. C. Friesner* no. 8666, May 12, 1935 (Butler Univ.; H); open woods ½ mile east of Lexington, Scott County, *C. C. Deam*, no. 40,128, May 12, 1924 (D); hard clay soil in clearing 4 miles northwest of Chrisney, Spencer County, *F. J. Hermann*, no. 6138, June 4, 1934 (G; H); dry beech woods about 1 mile northwest of Hillsdale, Vermillion County, *C. C. Deam*, no. 5838A, May 8, 1910 (D).

EUPATORIUM SEROTINUM Michx., var. **polyneuron**, var. nov., a var. typica differt foliis (oppositis vel ternatis) sessilibus, multinerviis basin versus integris, achaeniis 2.25–4 mm. longis.—Grassy clearing in low cut-over woods 2 miles northeast of Hanover, Jefferson County, *C. C. Deam*, no. 56,851, Sept. 23, 1935 (D; F; G—TYPE; H; N; NY; P), and no. 57,424, Sept. 23, 1936 (D; H; M; W); *F. J. Hermann*, no. 6768½, Sept. 22, 1935 (H).

The colony of this striking form of *Eupatorium serotinum* was discovered by Miss Edna Banta who showed it to Mr. Deam and the writer in the field. Plants of it were dug on June 19, 1935 and transferred to the Deam Garden at Bluffton and the University of Michigan Botanical Gardens from which the above collections were made during the flowering period. The original habitat is in the Illinoian Drift area on a hard white clay soil in an area wooded chiefly with beech, red gum, pin oak and some black oak. In grassy clearings in this cut-over woods a notable associate of the *Eupatorium* is *Eleocharis Wolfii*, this being the only known station for the *Eleocharis* in Indiana.

The cuneate bases of the sessile, many-nerved, usually opposite but occasionally ternate, leaves of var. *polyneuron* are entire; the involucral bracts tend to be more elongate, less blunt and less puberulent than in the typical plant; and the achenes are longer on the average (in typical *serotinum* generally less than 2 mm. long, averaging about 1.75 mm., in var. *polyneuron* varying from 2.25 (rarely only 2)–4 mm. long).

UNIVERSITY OF MICHIGAN

A TAXONOMIC STUDY OF LECHEA

Albion R. Hodgdon

(*Continued from page 69*)

6. L. TENUIFOLIA Michx. Caudex mostly reduced, hardly if at all branched: basal shoots 3–7 cm. long, bright-green, slender, often numerous and much branched, forming dense mats, the axis sparsely subappressed-pilose with fine hairs; leaves crowded, very numerous, glabrous, bright-green to lustrous above, subappressed- to somewhat spreading-pilose beneath on midrib and margin, narrowly lanceolate or oblanceolate to linear, 4–6 mm. long, 1 mm. or less in width, on young shoots frequently verticillate, later subapproximate or scattered: fruiting stems 1 to several, 12–40 cm. high, frequently low, openly spreading-branched mostly from below the middle, forming a subglobose to broadly spire-shaped inflorescence: young shoots and branches at first densely pilose, becoming sparsely and finely subappressed-pilose in maturity: cauline leaves scattered, linear to linear-subulate, acute, obscurely petioled, glabrous above, appressed-pilose beneath on midrib and margin, casually so elsewhere, mostly caducous, 0.8–2 cm. long, 1–1.5 mm. broad; rameal leaves much smaller, mostly persisting throughout the season: fruits racemose, frequently secund on the secondary branches, occasionally clustered, mostly subappressed: pedicels slender, mostly shorter than the calyx, 1–1.5 mm. long: calyx subglobose, broadest near the base, exceeding and completely enclosing the capsule, 1.6–1.9 mm. long; inner sepals strongly spreading-pilose, dull-green, ovate, subacute, the main vein alone prominent, forming a keel dorsally; outer sepals bright-green, leaf-like, narrowly lanceolate to linear, acute, 2–3 mm. long, 0.3–0.5 mm. broad, equaling to greatly exceeding the inner: capsule broadly ovoid, broadest near base, 1.4–1.7 mm. long, 1.3–1.5 mm. broad; valves but slightly spreading in maturity: seeds dull, yellowish- to reddish-brown, plump, broadened and greatly thickened toward the base, abruptly subacute to pointed at apex, mostly 2-sided, strongly convex dorsally, 2 in number and small (0.7–0.9 mm. long) or 3 and larger (0.9–1 mm. long or slightly longer), rarely 4–5 and ventrally keeled with 2 lateral faces.—Fl. Bor.-Am. i. 77 (1803); Pursh, Fl. Am. Sept. i. 91 (1814); Elliott, Sk. Bot. S. Car. & Ga. i. 185 (1816); Smith in Rees, Cycl. xx. (1819); Dunal in DC. Prodr. i. 286 (1824); Eaton, Man. 271 (1829); Dietr. Syn. Pl. i. 416 (1839); Leggett in Bull. Torr. Bot. Cl. vi. 251 (1878); Chapman, Fl. So. U. S. ed. 2, Suppl. 2: 678 (1892); Britton in Bull. Torr. Bot. Cl. xxi. 249 (1894); Robinson in Gray, Syn. Fl. N. Am. i^{1}. 193 (1895); Britton in Britton & Brown, Ill. Fl. ii. 443, fig. 2479 (1897); Chapman, Fl. So. U. S. ed. 3: 37 (1897); Britton, Man. 632 (1901) and subsequent editions; Small, Fl. Se. U. S. 799 (1903); Grosser in Engler, Pflanzenr. iv^{193}. 137 (1903); Robinson & Fernald in Gray, Man. ed. 7: 578 (1908); Small, Man. 882 (1933).

L. minor sensu Torrey, Fl. N. & Mid. St. 160 (1824); sensu Chapman, Fl. So. U. S. ed. 1: 36 (1860) in part; probably of other early American authors in part; not L. *L. minor* vars. β. and γ. Torrey & Gray, Fl. N. Am. i. 153 (1838); *L. minor* var. *dumosa* Torrey, Fl. N. Y. i. 79 (1843). *L. thesioides* Spach in Hook. Comp. Bot. Mag. ii. 285 (1836). *L. secundiflora* Rafinesque, New Fl. N. Am. i. 95 (1836).—Rocky or dry woods and hills, mostly inland, and on foothills and lower mountains of the Appalachian System and on the Ozark Plateau: southern Maine and New Hampshire (where rare) to South Carolina, west to southeastern Minnesota, eastern Nebraska, Kansas, Oklahoma and Texas. Because of the sharply defined character of this species throughout the Eastern States it is quite unnecessary to indicate specimens from this area. In Illinois, where the var. *occidentalis* occurs, and in the states west of the Mississippi River, where the possible occurrence of the variety could lead to misidentifications, I shall include representative specimens. Illinois: Oregon, Ogle Co., September 23, 1887, *M. B. Waite* (US); dry sandy soil, common, Braidwood, July, 1927, *Clute* (NY); dry sandy slopes or rocky banks, St. Peter's Sandstone, Utica, July 13, 1901, *E. J. Hill*, no. 137; sandy opens, Starved Rock Park, *F. W. Johnson*,. no. 1926 (NY); sand hills, Kankakee, July 25, 1873, *E. J. Hill* (NY); sandy barrens near Oquawka, May and October, 1874, *Patterson* (Field); sandy soil, Athens, Mason Co., 1861, *E. Hall* (Field); in woods on dry bluff, Cedar Glen, Hancock Co., *F. C. Gates*, no. 10,112 (Field); open ground, sterile soil, Parkersburg, Richland Co., *E. J. Palmer*, no. 15,624 (Mo); rock-barrens, Makanda, June 12, 1903, *Gleason*. Minnesota: opposite Hudson, Wisconsin, St. Croix River, July 22, 1890, *Holzinger* (NY). Iowa: Wild Cat's Den, Mount Pleasant, Muscatine Co., August 1891, *J. H. Mills;* dry soil, infrequent, Van Buren Co., August 1, 1896, *J. T. & M. F. L. Fitzpatrick* (Field). Missouri: River Heights, near Hannibal, Marion Co., July 23, 1919, *J. Davis* (Mo); dry open woods, east of Bethel, Shelby Co., June 29, 1933, *Palmer & Steyermark*, no. 40,910 (NY); sandy woods, local, south of Sui Mills, Jackson Co., *Mackenzie*, no. 515 (NY); Pacific, *E. E. Sherff*, no. 995 (Field); Bismark, September 10, 1893, *Bush* (Mo); on dry sandy roadsides, Vernon Co., July 16, 1873, *G. Broadhead* (Mo); Shannon Co., July 24, 1891, *Bush* (Mo); post-oak woods, vicinity of Strafford, Greene Co., *P. C. Standley*, no. 9431 (US); common in sandy and dry soil, 13 miles northwest of Joplin, *E. J. Palmer*, no. 266; common, Montier, *Bush*, no. 56 (NY); Poplar Bluffs, August 15, 1875, *Letterman* (Mo); dry open woods, Willow Springs, Howell Co., *E. J. Palmer*, no. 6229 (Mo); dry soil, McDonald Co., *Bush*, no. 17A. Arkansas: dry open ground, Beaver, Carroll Co., *E. J. Palmer*, no. 6369 (Mo); Benton Co., 1899, *Plank* (NY); dry sandy slopes, London, Pope Co., *E. J. Palmer*, no. 8163 (NY); Big Creek, Sebastian Co., *Demaree*, no. 3125 (US); Fort Smith, 1853–54, *J. M. Bigelow* (US); dry open woods, Pulaski Heights, Little Rock, Pulaski Co., *Demaree*,

no. 8121; moist flat woods, Fulton, Hempstead Co., *E. J. Palmer*, no. 12,679 (NY); near Texarkana, Miller Co., alt. 300 ft., *A. A. & E. G. Heller*, no. 4154. LOUISIANA: dry woods, Natchitoches, June 10, 1915, *E. J. Palmer*, no. 7948 (NY); hill top at Fort Bulow, vicinity of Alexandria, *C. R. Ball*, no. 538; vicinity of Covington, *G. Arsène*, no. 11,816 (US). KANSAS: Galena and vicinity, 8 miles south of town, *Rydberg & Imler*, no. 272 (NY). OKLAHOMA: vicinity of McAllister, May 16, 1883, *Oyster* (Mo); open sandy land, near Grant, Choctaw Co., *H. W. Houghton*, no. 4017. TEXAS: dry prairies, Bowie Co., June 13, 1898, *Eggert* (NY); in sandy woods, Greenville, June, 1913, *D. A. Saunders* (NY); near Paris, Lamar Co., *A. A. & E. G. Heller*, no. 4213 (US); common on hills, Marshall, *Bush*, no. 1013 (Mo); Comanche Spring, June, 1849, *Lindheimer*, no. 678: Weatherford, *Tracy*, no. 8059 (Mo); Troup, June 8, 1927, *L. McGregor*, no. 7183 (US); sandy woods, Granbury, *Reverchon*, no. 52 (Mo); Hempstead, *E. Hall*, no. 32; prairie, near Houston, June, 1892, *Lindheimer;* New Braunfels, June, 1850, *Lindheimer*, no. 677. PLATE 489, FIGS. 5, 6 and 7; MAP 8.

Var. **occidentalis**, var. nov. Habitu varietati typicae similis sed parum robustior ramis erectioribus; folia basilaria et caulina viridia sed opaciora et dorso densius pilosa; fructus latior et longior; sepala interiora 1.9–2.2 mm. longa; sepala exteriora interiora valde superantia; capsula 1.7–2.1 mm. longa late ovoidea vel elongato-ovoidea; valva sepala interiora subaequans; semina 2–4 (plerumque 2) pallide brunnea crassa magna (1–1.2 mm. longa) ca. 0.55–0.7 mm. lata parum inaequilateralia dorsiventraliter compressa.—Dry woods, sandy places and rocky slopes, south-central Nebraska, central Kansas and Oklahoma to central and eastern Texas but not on the Coastal Plain, also in several scattered localities in northern Illinois. I have seen the following specimens. ILLINOIS: Fountaindale, Winnebago Co., *Bebb* (Field); Dixon, *Vasey;* in sandy woods, Peoria, July, 1895, *F. E. McDonald* (Mo). NEBRASKA: Minden, September, 1897, *Hapeman* (NY). KANSAS: Pottawatomie Co., August 30, 1895, *J. B. Norton*, no. 30 (TYPE in Gray Herb.); sandy hills, St. George, August 13, 1895, *Norton*, no. 375 (NY); Stafford Co., *M. A. Carleton*, no. 299 (US). OKLAHOMA: on dry rocky ledges, near Pawhuska, Osage Co., *G. W. Stevens*, no. 2004; common, Sapulpa, Indian Territory, *Bush*, no. 1357 (NY); dry rocky sandy clay cliff, 1 mile west of Oilton, Payne Co., *R. Stratton*, no. 89 (Mo); Lincoln Co., July 26, 1895, *L. A. Blankinship;* roadside, 1 mile south of Luther, Oklahoma Co., *R. Stratton*, no. 271 (Mo); 3 miles west of Kendrick, July 19, 1905, *A. H. Van Vleet* (US); Pottawatomie Co., August 8, 1900, *P. J. White*, no. 91 (Mo); Davis, *W. H. Emig*, no. 674 (Mo); chiefly on the False Washita between Fort Cobb and Fort Arbuckle, Indian Territory, 1868, *Edw. Palmer* (NY); on mountain side, near Cache, Comanche Co., *G. W. Stevens*, no. 1336½; gravelly soil among rocks, Wichita Mountains, Indian Territory, *C. G. Sheldon*, no. 205 (Mo). TEXAS: on the Sabi-

nas, on rocks, July, 1847, *Lindheimer* (Mo); in sandy pasture land, growing with *L. villosa*, Tarrant Co., *Ruth*, no. 399 (NY); rocks, Palo Pinto Co., August 17, 1877, *Reverchon*, no. 782 (NY); on sandstone rocks, Stephens Co., August 17, 1877, *Reverchon*, no. 782; on sandstone rocks, Eastland Co., August, 1876, *Reverchon*, no. 2320 (Mo); granite glades, Granite Mountain, Burnet Co., *E. J. Palmer*, no. 10,267 (Mo); Enchanted Rock, Llano Co., June 1, 1930, *Tharp & Whitehouse*, no. 86,950 (mixed with *L. san-sabeana* and distributed as *L. tenuifolia*). Plate 489, figs. 8 and 9; map 9.

On the basis of the type-specimen which is preserved in the Michaux Herbarium at Paris, the name *Lechea tenuifolia* stands for the plant under present consideration. Fernald, in 1903, saw the specimen and reported it to agree with our *L. tenuifolia*.

Elliott[1] cites "*L. juncifolia?* Walt." as a synonym of *L. tenuifolia*. Walter's description[2] is as follows, "foliis radicalibus teretibus, calyce nullo"; and *Index Kewensis* cites *L. juncifolia* as a synonym of *L. tenuifolia*, despite the fact that Torrey & Gray,[3] after quoting Walter, quite logically say it "is wholly unknown but doubtless belongs to some other order." Grosser,[4] in his treatment of *L. tenuifolia*, follows *Index Kewensis* in citing *L. juncifolia* and, in addition, he cites as a synonym Rafinesque's *L. verna*, which was not described in the latter's monograph[5] but only cited as a name, l. c. p. 92, along with *L. juncifolia* as a synonym of *L. tenuifolia* Michaux. All three of these Rafinesque includes in the subgenus "*Menandra*," which he describes, l. c. p. 90, as having, "2 short sepals or almost lacking," consequently having nothing to do with our *L. tenuifolia*. Rafinesque does, however, l. c. p. 95, describe *L. secundiflora*, which can hardly be anything else. Part of the description I quote, "leaves scattered, lax narrow linear . . . flowers remote secund, pedicels short." It is placed by Rafinesque in his subgenus *Eudiexa*, which has the external sepals longer than the internal. All of these characters belong to *L. tenuifolia* and the remainder of the description is not conflicting. Therefore the name belongs in the synonymy of *L. tenuifolia*.

Spach's description[6] of *Lechea thesioides* is exceptionally complete and accurate and his species belongs obviously to our *L. tenuifolia*.

[1] Sk. Bot. S. Car. & Ga. i. 185 (1816).
[2] Fl. Car. 83 (1788).
[3] Fl. N. Am. i. 154 (1838).
[4] Engler, Pflanzenr. iv[193]. 137 (1903).
[5] New Fl. N. Am. i. 89–98 (1836).
[6] Hooker, Comp. Bot. Mag. ii. 285, 286 (1837).

Lechea minor vars. β. and γ. of Torrey & Gray[1] are by their descriptions probably *L. tenuifolia.* However, there are specimens of *L. tenuifolia* labeled *L. minor* var. γ. in the Herbarium of the New York Botanical Garden; and presumably the type-specimen of this variety, mentioned as *L. tenuifolia* by Britton, is one of these, but among the specimens of *L. racemulosa* there are plants labeled *L. minor* var. *gracilis,* which is the name later given by Torrey[2] to the earlier var. α.

L. tenuifolia, while fairly constant in general habit and leaf-characters, varies strikingly in the seeds and capsules. Generally speaking there are two types, a smaller-seeded and -fruited form and one with larger fruiting parts. Both occur sporadically anywhere in the range, having no distinct ranges or other morphological characters which would enable one to split the species. A similar type of variation exists in *L. maritima* var. *typica;* and there again the two slightly differing types of plants permit of no classification along evident lines of geographical variation.

In and close to the Driftless Area and on the Great Plains and rolling uplands of Nebraska and from central and eastern Kansas to central Texas there occurs a distinct variety of *Lechea tenuifolia.* It differs from the typical form of the species in its woody and more extensive caudex, in its more striking pilosity (both of cauline and basal leaves) and particularly in its very long exterior sepals, large capsules and seeds. Its occurrence in northern Illinois in or near "the Driftless Area," at least 400 miles from the nearest station to the west, is particularly interesting. These Illinois stations (Winnebago Co., Dixon and Peoria) are included in the area which was covered by the Illinoian but not by the Wisconsin Ice.[3] Moreover, the first two stations are but a short distance, 30–50 miles, from "the Driftless Area." Reference to Antevs' map shows that the position of St. George, Kansas, the nearest station to the west, is on the border between the Kansan Drift and the entirely unglaciated area of the South and West where the remaining stations are located. The distribution appears to be definitely correlated with lack of glaciation and at the same time with a dry climate, since the variety is absent from southern Illinois and Missouri. The spread of the variety must

[1] Fl. N. Am. i. 153, 154 (1838).
[2] Fl. N. Y. i. 79 (1843).
[3] E. Antevs, Maps of the Pleistocene Glaciation in Bull. Geol. Soc. Am. xl. 645, fig. 6 (1929).

have taken place before the Wisconsin; otherwise it would occur in suitable intervening areas. That it survived the entire Pleistocene in the Driftless Area is also possible. At least, in the western part of its range it has failed to move far, even on to the Kansan Drift. Its very scattered distribution over a considerable area indicates, likewise, a considerable antiquity.

7. L. **mensalis**, sp. nov. Caudex plerumque simplex; rami basilares subprocumbentes vel adscendentes, 1–4 cm. longi dense subadpresseque pilosi; folia basilaria 3–5 mm. longa anguste linearia supra glabra subtus subadpresse pilosa praecipue in costa; folia caulina anguste linearia acuta 8–15 mm. longa 0.7–1.2 mm. lata subtus costa et margine sparse patuleque pilosa; caules floriferi numerosi 15–25 cm. alti graciles sparse patulo-pilosi praecipue supra medium ramosi, rami simplices vel furcati; fructus in racemos densos dispositi; pedicelli adpressi vel patuli 1.5–2 mm. longi subadpresse pilosi; calyx fructifer ovoideus 1.9–2 mm. longus 1.5–1.7 mm. latus capsulam superans et tegens; sepala interiora dense subadpresseque pilosa obscure carinata; sepala exteriora anguste linearia interiora aequantia; capsulae inaequilateraliter ovoideae subangulatae 1.6–1.8 mm. longae 1.2–1.3 mm. latae valvae subaequales obscure carinatae; semen 1, 1 mm. longum subaequilateraliter ovoideum sub apice dorsiventraliter compressum.—A single station in the Chisos Mountains of southwestern Texas. Texas: Chisos Mountains, July 28, 1931, *C. H. Mueller*, no. 8102 (type in Gray Herb.), distributed as *L. tenuifolia* Michx. Plate 489, figs. 1, 2, 3, and 4; map 10.

Lechea mensalis, while represented in herbaria only by the collection cited above, is one of the very distinct members of the genus. Its slender panicles of strongly ascending branches serve, at once, to separate it from the broadly spreading-branched *L. tenuifolia* or from the more strict *L. tenuifolia* var. *occidentalis*. Since the two latter have from 2–3 seeds borne in capsules which are about as broad as long, the contrast with *L. mensalis* becomes more marked, for it has a narrowly ovoid capsule bearing but 1 seed. That it is related to *L. tenuifolia* is shown by a combination of characters rather than by any single striking characteristic. *L. mensalis* has fruits borne on fairly long pedicels and arranged uniformly in racemes, calyces and capsules broader below the middle than above, cauline and basal leaves very narrow and the exterior sepals about equal in length to the inner.

The Chisos Mountains of southwestern Texas, where this *Lechea* was collected in 1931 by *C. H. Mueller*, are noted for the endemism and the breadth of relationship of their flora. They attain a sufficient

elevation to support on their flat summits a flora quite different from that of the surrounding desert areas. In the latter part of June, 1934, Mr. G. B. Rossbach and I climbed nearly to the plateau-like summit of Emory Peak (the highest point in the Chisos Mountains). At the point (slightly less than 2500 meters altitude) where we were forced by approaching darkness to turn back, the terrain, becoming mesophytic, began to appear suitable for the growth of Lecheas. It is probable that the specimen came from the extensive summit, in which case it would mark the upper limit in altitude for any member of the genus.

It seems very probable, in view of the very diversified geographic elements in the flora of these mountains, that their floristic history extends back many millions of years. *Lechea mensalis* is a single instance to suggest the antiquity of that flora.

The reduction of seeds per capsule to 1 is matched in the east by *L. patula*, *L. Deckertii*, *L. divaricata*, *L. cernua* and in a small proportion of capsules of *L. racemulosa*. The last, usually with 2 seeds but occasionally with only 1 in a capsule, has a broad range on the Coastal Plain and in the southern Appalachian Mountains. *L. patula* extends north from Florida to South Carolina. The remaining three species are confined to restricted areas in the Florida Peninsula. Of the species in the genus having numerous (3–6) seeds per capsule, *L. intermedia*, *L. villosa* (except var. *Schaffneri*), *L. minor*, *L. Leggettii* var. *typica*, *L. tenuifolia* (except in var. *occidentalis*), *L. Torreyi*, *L. maritima* (except in var. *virginica*) and *L. tripetala*, are the dominant species over most of the range of the genus. A reduction in the number of seeds appears almost to be an invariable accompaniment of extensive curtailing of range, since of very localized species only *L. san-sabeana* and *L. cubensis* (which is little known) have more than 1 or 2 seeds. Moreover, *L. san-sabeana*, which by the development of persistent and hard dissepiments has retained the potential capacity to produce 6 seeds, rarely produces perfect mature ones. The Florida species, *L. Deckertii*, *L. divaricata* and *L. cernua*, have developed extremely hard capsules which remain closed in maturity and in which there has even been a growing together of the valves of the capsule. Because these species grow in geologically ancient areas or in areas having old floras and are cut off by wide areas from their relatives or, as in some cases, are so distinct that it is difficult to say to what species they are related, I am of the opinion that the 1-seeded condi-

tion, possessed by them, is a natural consequence of segregation, specialized adaptation and old age.

8. L. Deckertii Small. Plant low, 7–28 cm. high, pale-green, broadly globose- to subcylindric-paniculate, with fine wiry branches, mostly suffruticose, only the upper branches and the tips of the stem regularly dying back at the end of the season: true basal shoots lacking, the young shoots starting from any part of the shrubby plant: leaves of the young shoots linear, abruptly acute or obtuse, sparingly subappressed-pilose beneath on midrib and margin, glabrous above, 1.5–3.5 mm. long; leaves of the developing shoots crowded, numerous, similar, conspicuously pilose beneath, 3–6 (–7) mm. long; those of the mature shoots inconspicuously pilose on midrib and margin beneath, 1.5–5 mm. long, of the ultimate branches persistent, 1.5–2.5 mm. long: flowers scattered, few to fairly numerous: fruit maturing irregularly, scattered: pedicels slender, weak, 1–2 mm. long, sparsely and finely pilose to glabrous: calyx broadly (nearly horizontally) spreading, not at all enclosing the capsule; interior sepals elliptic-ovate to elliptic-obovate, obtuse, deeply concave, sparsely and finely pilose to glabrous, 1–1.2 mm. long; exterior sepals linear, from one-half to two-thirds as long as the inner: capsules lustrous, prominent, free from the calyx, subglobose, as broad as long, 1.2–1.5 mm. in diameter; the valves papery, not readily separating in maturity: seeds 1 (2), 0.8–1 mm. long, much enlarged at the base, the axis greatly curved, unequally 3-sided, the two lateral faces very unequal.—Torreya, xxvii. 103 (1927) and Man. 884 (1933). *L. myriophylla* Small, Man. 884 (1933).—Sand-hills and scrub, inland, south-central Georgia to southern Florida. The following are typical. Georgia: sand-hills of Seventeen Mile Creek, Coffee Co., *Harper*, no. 1461; sand-hills of Satilla River, Coffee Co., *Harper*, no. 1443 (NY). Florida: scrub, Tavarese, June 29, 1893, *Rolfs* (Field); Killarney, September, 1889, *O. Vesterland* (US); sand-hills about Lake Jackson, *Small, Small & DeWinkeler*, no. 10,643 (NY); dunes, Highlands Co., August 29, 1934, *M. E. Baker* (NY) (as *L. myriophylla*); east of Sebring, De Soto Co., *Small & DeWinkeler*, no. 9772 (NY), the type of *L. myriophylla* Small; scrub, near Kuhlman, DeSoto Co., *Small & DeWinkeler*, no. 9799 (NY), as *L. myriophylla;* scrub, near Lemon City, *Small, Small & DeWinkeler*, no. 10,324 (NY); scrub, Lemon City, Dade Co., July, 1926, *R. F. Deckert* (type, Herb. N. Y. Bot. Gard.). Plate 489, fig. 10; map 11.

The relationship of *Lechea Deckertii* is definitely with *L. patula*. The general habit and the leaves of both are similar. Furthermore, both have certain similarities of the fruits which are of diagnostic importance. The capsule of each is exserted far beyond the calyx which, in either species, is much reduced in size. The differences, however, are several of a fundamental nature. *L. Deckertii* has a

broadly spreading calyx of short exterior sepals and longer interior ones. The capsule is nearly globose and has thin papery valves. *L. patula* has a somewhat spreading to nearly appressed calyx of long exterior sepals and equal or shorter interior sepals, and the capsule is elongate-ovoid or elongate-obovoid, with firm to indurated valves.

The difficulty in identifying specimens of *Lechea Deckertii* is as great as in *L. patula.* Both species pass through similar stages of development of vegetative parts wherein strong contrast is shown between early and late conditions. Here, as in *L. patula,* Small has described as a new species a plant, in this case *L. myriophylla,* distinguished mainly on characteristics of the shoots during a period of strong vegetative development.

In the descriptions of *Lechea myriophylla* and *L. Deckertii*[1] the following differences are given: the leaves of the former are stated to be "3–5 mm. long, acute and somewhat loosely strigose or glabrous," those of the latter "1.5–2.5 mm. long, acutish, glabrous or nearly so." *L. Deckertii* is further described "panicles few–several flowered"; *L. myriophylla* as having "panicles many flowered"; finally the sizes of the capsules are given as "1.2–1.4 mm. long" for *L. Deckertii* and as "1.5 mm. long" for *L. myriophylla.*

From my comparisons of the type-specimens of *Lechea Deckertii* and *L. myriophylla* with many other sheets of *L. Deckertii* from several herbaria I find that *L. myriophylla,* the more recently described species of Small, represents merely a phase of *L. Deckertii* wherein a very considerable growth has taken place in the young shoots, accompanied by the development of comparatively large leaves. This is parallel with the situation in *L. patula,* in which different states of development of one species have led to the increase of useless synonyms. *L. Deckertii* varies, as might be expected, in the quantity of pubescence on the leaves. Some specimens, agreeing in most respects with Small's strict definition of that species, have leaves as strongly pilose as are those of his *L. myriophylla.* The size of capsules is similarly variable. I have seen no flowering or well developed "fruiting panicles" of *L. myriophylla* but those of *L. Deckertii* are frequently many-flowered.

The status of *Lechea Deckertii* as a distinct species is unquestionable. The characters of the few mature seeds which I have found in the capsules in conjunction with the other characteristics attest this.

[1] Small, Man. 884 (1933).

The one character (not mentioned by Small) which seems to support his *L. myriophylla* is its nearly glabrous calyx. But this character is not very reliable: in the New Jersey Pine Barrens several specimens have been collected of *L. Leggettii* var. *moniliformis* with perfectly glabrous calyces but in all other respects similar to characteristic specimens of that variety. Because of its sporadic occurrence in two separate species, unaccompanied by other and fundamental differences, I regard the total or almost complete loss of hairs from the calyces as a mutation which is confined to but a few plants and which will probably persist for only a short time within a species or variety. Several others of the rather limited number of specimens of *L. Deckertii* now to be found in herbaria could be thoroughly described as individuals (stressing the vegetative characters) to make about as distinct species as does *L. myriophylla* Small.

9. L. DIVARICATA Shuttleworth. Plant subherbaceous, the caudex multicipital, mostly subprocumbent: basal resting shoots lacking; the young shoots in late spring or summer mostly from near the base, immediately developing, densely villous on the axis: basal leaves few, scattered, alternate, densely villous beneath on midrib and margin, mostly glabrous above, lance-ovate to elliptic-lanceolate, acute to pointed, 2–3 mm. long: fruiting stems frequently numerous, slowly developing, mostly dying after fruiting, 25–60 cm. high, divergently and somewhat divaricately branched from near the base; the principal branches 15–30 cm. long: leaves absent from the main stem, abundant and crowded, mostly spreading on the branches, spreading-pilose to villous on the lower surface on midrib and margin, glabrous above, narrowly lance-ovate to elliptic-lanceolate, acute, 5–8 mm. long: secondary branches very short, mostly 1–3 cm. long, becoming little more than fruiting clusters upward: stamens numerous (15–25): fruits loosely to compactly clustered: pedicels stout, densely subappressed- to spreading-pilose, 1–1.5 mm. long: calyx strongly pyriform, broadly spreading above the very considerable (5–8 mm. long), pale obconic receptacle; interior sepals elliptic-ovate, obtuse, spreading-pilose to villous, 1.3–1.5 mm. long; exterior sepals narrowly lanceolate, two-thirds as long as the inner: capsule exserted, considerably exceeding the calyx, elliptic-ovoid, 1.8–2 mm. long, 1.6–1.7 mm. broad, lustrous; the valves indurated (very hard), coalesced, neither sharply defined nor separable in maturity: seeds 1–3 (–4), mostly 1 normal and mature, the others aborted and shrunken, 1.2–1.4 mm. long, mahogany-brown, with a thin white covering, broadest at the base, narrowing unequally upward to the apex, irregularly convex dorsally, concave to obscurely 2-faced ventrally, the endosperm dense, obscuring the embryo.—Shuttleworth ex Britton in Bull. Torr. Bot. Cl. xxi. 249 (1894); Small, Fl. 799 (1903) and Man. 883 (1933). *L.*

major var. *divaricata* Gray in Robinson in Gray, Syn. Fl. N. Am. i[1]. 192 (1895); Grosser in Engler, Pflanzenr. iv[193]. 137 (1903).—Sandy soil, mostly near the coast, central and southern Florida. The following specimens have been seen by me. FLORIDA: in dry sandy soil, Sanford, June 28, 1920, *S. Rapp* (NY); dry sandy soil, Eau Gallie, Indian River, *Curtiss*, no. 5709; Hernando Co., June–July, 1898, *A. S. Hitchcock* (Field); St. Petersburg, August, *C. S. Williamson* (NY); Manatee, June, 1878, *Garber;* in pinetis ad fl. Manate—Florida austr. occ., *Shuttleworth* (TYPE in Gray Herb.). PLATE 490, FIG. 1; MAP 12.

This very distinct species of *Lechea* has been variously misunderstood by students of the genus. Leggett,[1] speaking of *L. major*, our *L. villosa* Ell., said "I suspect the *L. divaricata* Shuttleworth from Florida is only a form of this with many stamens, 30 or more." Britton,[2] after briefly describing the plant, said, "I have not seen the radical shoots and am consequently uncertain of the alliance of the species but think there is little doubt of its near relationship to L. villosa." Among the specimens he cites is one from Texas, "*E. Palmer*, no. 2025." Robinson,[3] following Gray, made the combination *L. major* var. *divaricata* and cited among other specimens "Texas, *Palmer*" and "Mex., *Schaffner*" as belonging to it. Grosser, largely following Robinson's treatment, called the plant *L. major* var. β. *divaricata* and included Palmer's collection, no. 2025, from Texas, but eliminated the Mexican material of Schaffner. Small[4] gave the range as "Florida and Texas" and very recently[5] stated the range, "pen. Fla., also reported from Tex."

Probably a half-dozen differences exist between *L. villosa* and *L. divaricata.* The most distinguishing characters lie in the fruits and these are of a more fundamental order than are to be found among any of our northern Lecheas. First and most important, the capsule, which greatly exceeds the calyx, is extremely hard and indehiscent, the valves having quite coalesced. The one seed (occasionally more) is dark-brown, with a membranaceous coat, irregularly ovoid and very large. The leaves are always very small, never reaching 1 cm. long. It would be difficult to find any *Lechea* differing more from *L. villosa* in everything except quality of pubescence and the general shape of the leaves, both of which are vegetative characters and not in them-

[1] Bull. Torr. Bot. Cl. vi. 251 (1878).
[2] Bull. Torr. Bot. Cl. xxi. 249 (1894).
[3] Gray, Syn. Fl. N. Am. i[1]. 192 (1895).
[4] Fl. Se. U. S. 799 (1903).
[5] Man. 883 (1933).

selves necessarily indicative of close relationship. All of the authors mentioned above regarded pubescence in the genus as being of great importance. The obvious thing for them to do, then, was to relate the two species having strongly villous pubescence. The equally obvious consequence has been the inclusion in the species *L. divaricata* of certain peculiar growth-forms of *L. villosa*, the Texan specimen of *Palmer*, no. 2025, for example. Nothing but hopeless confusion will ever result from a classification of these plants by their vegetative characteristics alone.

In characters of fruit this species is closest to *Lechea Deckertii* and *L. patula*, all three having usually 1-seeded capsules which in the first two are of coalesced valves. *L. patula* has the valves partly united. The specialization, consisting of reduction in number of seeds and coalescing of valves, arrived at in *L. divaricata* probably accounts for the fact that it is not common.

10. L. RACEMULOSA Michx. Caudex short, mostly simple; basal shoots in August and September, spreading-ascending to suberect, in maturity frequently branched, 3–8 cm. long; the axes strongly spreading-pilose: basal leaves frequently verticillate, bright-green, thin, oblong-ovate to elliptic-lanceolate, acute to slightly mucronate, 4–6 mm. long, 1.5–2.5 mm. broad, on the lower surface subappressed- to spreading-pilose along the midrib and prominently spreading-pilose to villous on the margin, glabrous above: fruiting stems several, 25–40 cm. high and loosely to compactly paniculate-branched, or one 10–15 cm. high, globular-paniculate and very leafy-branched; the axis sparingly and minutely pilose: primary branches spreading to ascending, diminishing upward; secondary branches scattered, slender: cauline leaves acute to slightly mucronate, at first narrowly elliptic-lanceolate, becoming narrowly oblanceolate; rameal leaves acute and narrowly lanceolate to linear, acute, sparsely subappressed-pilose beneath on midrib and margin: fruits scattered-racemose on the secondary branches: pedicels filiform, sparsely and finely subappressed-pilose to glabrous, 1.5–3.5 mm. long, usually slightly exceeding the calyx: calyx narrowly pyriform, sparingly to strongly subappressed-pilose, 1.8–2 mm. long, slightly more than half as broad; interior sepals narrowly elliptic to spatulate, subacute to obtuse; exterior sepals narrowly lanceolate or linear, considerably shorter than the inner: capsule equaling to slightly exceeding the calyx, slenderly ellipsoid to slenderly ovoid, 1.7–1.9 mm. long, 1–1.2 mm. broad, often distinctly inequilateral: seeds 1–3, mostly 2, 1–1.3 mm. long, about half as broad, dark-brown, the embryo not visible through the endosperm, oblong-ovoid, nearly equilateral, dorsiventrally compressed, the dorsal surface slightly rounded-convex, the ventral surface flattened.—Fl. Bor.-Am. i. 77 (1803); Pursh, Fl. Am. Sept. i. 91 (1814); Elliott,

LECHEA MENSALIS: FIG. 1, TYPE, × ⅖; FIG. 2, fruits, × 8; FIG. 3, capsules, × 8; FIG. 4, seeds, × 10.
L. TENUIFOLIA: FIG. 5, fruits and separated capsule, × 8; FIGS. 6 and 7, seeds, × 10.
L. TENUIFOLIA, var. OCCIDENTALIS: FIG. 8, fruits and capsule, × 8; FIG. 9, seeds, × 10.
L. DECKERTII: FIG. 10, fruits, × 8, from TYPE.
L. TRIPETALA: FIG. 11, seeds, × 10.

Sk. Bot. S. Car. & Ga. i. 184 (1816), in part; Smith in Rees, Cycl. xx. (1819); Torrey, Fl. N. & Mid. St. 161 (1824); Dunal in DC. Prodr. i. 285 (1824); Torrey, Comp. Fl. N. & Mid. St. 74 (1826), in part; Leggett in Bull. Torr. Bot. Cl. vi. 251 (1878); Chapman, Fl. So. U. S. ed. 2. Suppl. 678 (1892); Britton in Bull. Torr. Bot. Cl. xxi. 248 (1894); Robinson in Gray, Syn. Fl. N. Am. i[1]. 195 (1895); Britton in Britton & Brown, Ill. Fl. ii. 442, fig. 2476 (1897); Chapman, Fl. So. U. S. ed. 3: 37 (1897); Britton, Man. 632 (1901); Grosser in Engler, Pflanzenr. iv[193]. 135, fig. 22, A–M (1903); Small, Fl. 798 (1903); Robinson & Fernald in Gray, Man. ed. 7: 579 (1908); Stone, Pl. So. N. J. 562, pl. 83, fig. 2 (1911); Small, Man. 883 (1933). *L. minor* α. Torrey & Gray, Fl. N. Am. i. 153 (1838). *L. minor* var. *gracilis* Torrey, Fl. N. Y. i. 79 (1843). *L. minor* of many early American authors, in small part; not L.—Sandy fields and barrens of the Coastal Plain and slopes and summits of the southern Appalachian Mountains, tolerant of limestone, Georgia to Missouri, north to southeastern New York, Pennsylvania, West Virginia and Indiana. The characters of *L. racemulosa* are sufficiently distinct to make unnecessary the citation here of representative specimens. Map 13.

The name *Lechea racemulosa* has been attributed variously to Michaux and to Lamarck. The Michaux description is quite satisfactory for the species. Furthermore, there is a type-specimen in the Michaux Herbarium which is mentioned by Britton.[1] Lamarck has been given the credit for the name on the basis of the date 1793 on the title page of Tome ii. "Tableau Encyclopédique et Méthodique." According to a note of C. Davies Sherborn and B. B. Woodward,[2] Tome ii.[2] 137–551, with title-page dated 1793, was published in 1819, their source of information being Bibl. Franc. Nov. 6, 1819: 513 (1819). The description of *L. racemulosa* was on page 423 in this volume. Here there is reference to an illustration[3] which was published in 1797, a figure of a *Lechea*, placed wrongly with *Gaura*. Lamarck stated that the illustration applied to *L. racemulosa*, at the same time referring back to "Dict. Suppl. no. 2" (*i. e.* the second species under *Lechea*),[4] where the name is ascribed to Michaux. I should have to take his word, however, for the identity of the subject of the illustration, since no specific characters are delineated. It is the same, or worse, with all of Lamarck's illustrations of *Lechea*.

The distribution of *Lechea racemulosa* shows it to be a settled and presumably very old species. It is decidedly abundant on the sum-

[1] Bull. Torr. Bot. Cl. xxi. 248 (1894).

[2] Annals and Magazine of Natural History, June (1906); partially repr. in Journ. Bot. xliv. 318–320 (1906).

[3] Lam. Rec. de Planch. Bot. de l'Encycl. ii. pl. 58 (1797).

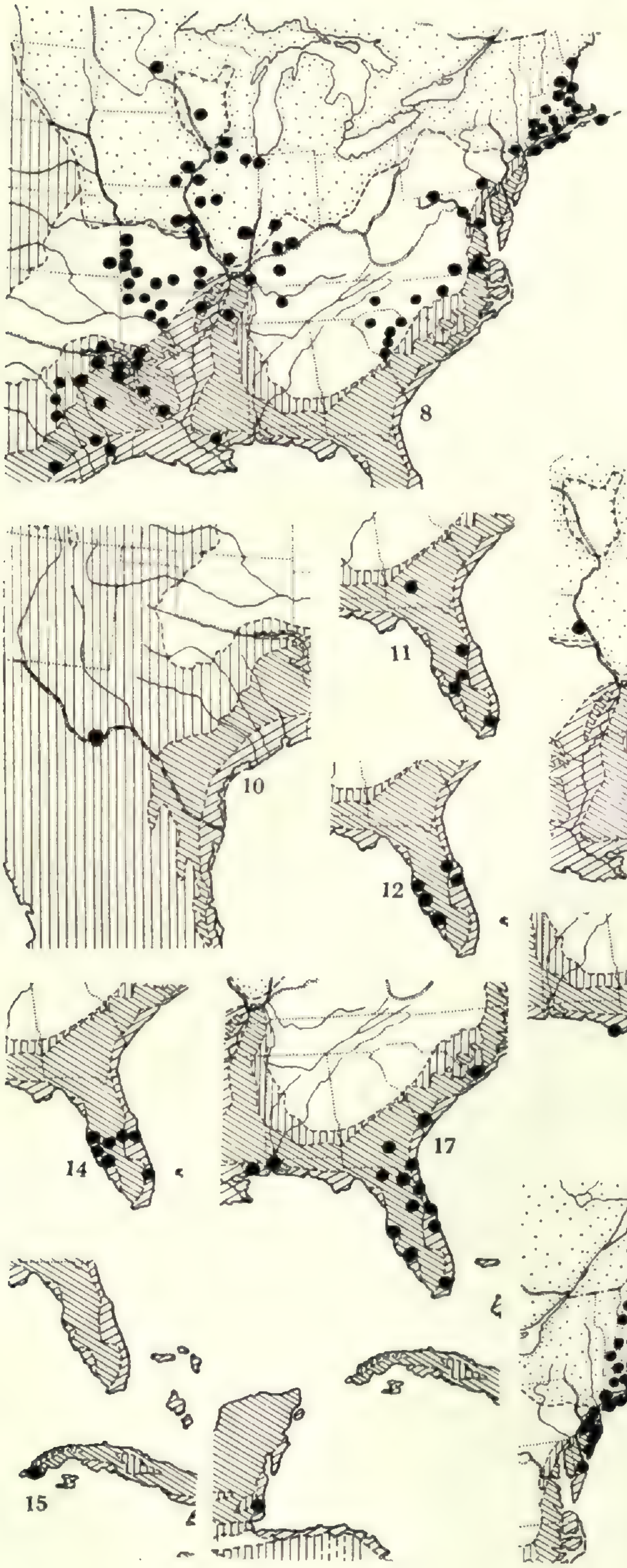
[4] Encycl. Method. Suppl. iii. 340 (1813).

mits and slopes of the high Appalachians and almost equally prominent on the Coastal Plain. That its present range is not of recent origin is shown by its presence only in or very close to areas generally considered to have escaped continental glaciation during the Pleistocene. The one exception to this is the station at the southern end of Lake Michigan in Indiana. The fact that several other species of *Lechea*, otherwise rare in or absent from supposedly glaciated areas, are found here and at times also along the shore of Lake Erie, points to the obvious conclusion that the distribution around the Great Lakes was attained at some time long previous to the present, during some phase of the Wisconsin ice-advance or even before the Wisconsin.

The characters of *Lechea racemulosa* are very constant, as much so, in fact, as those of *L. minor*. On the Coastal Plain, on the Appalachian summits and on the dunes of Lake Michigan there are no perplexing forms or trivial variations, of which we find an abundance in most of our northern species.

Although both distribution and constancy of characters indicate a considerable antiquity for the species, the characters in most cases seem to be derived ones, the reduction of seeds per capsule to one or two for example. It is apparent throughout the genus, in fact, that those species which are obviously derived from a primitive type, either by great reduction or by coalescence of parts or by prominent modification of parts, are found in definitely ancient floristic areas. The unmodified primitive characters, on the other hand, are, generally speaking, possessed by several wide-ranging species, rejuvenated in glaciated America.

11. L. CERNUA Small. Plant with an extensive branching caudex or commonly suffruticose and with most of the principal branches persisting: basal shoots lacking; the shoots borne frequently far below the middle, reaching nearly full size and extensively branching (but not fruiting) the first season, in maturity spreading-ascending, 20 or more cm. long, their axes and those of the branches densely and somewhat divergently pilose: leaves decidedly heteromorphic, crowded; the earliest small, about 0.5 cm. long, not more than half as broad, densely spreading-pilose on both surfaces; the later comparatively large, thick, 0.5–1.2 cm. long, often nearly as broad, elliptic-ovate to orbicular, acute- to mucronate-tipped, densely subappressed- to spreading-pilose or subtomentose on both surfaces; those of the mature branches narrowly elliptic-ovate, narrowing gradually to the acute or pointed tip, less than 1 cm. long, densely pilose to subtomentose below, pilose above with more scattered hairs: fruits sparse, in open fascicles of a few each at the tips of and along the short fruiting



Map 8, range of Lechea tenuifolia; 9, of L. tenuifolia, var. occidentalis; 10, of L. mensalis; 11, of L. Deckertii; 12, of L. divaricata; 13, of L. racemulosa; 14, of L. cernua; 15, of L. cubensis; 16, of L. Torreyi; 17, of L. Torreyi, var. congesta; 18, of L. maritima, var. typica; 19, of L. maritima, var. virginica; 20, of L. maritima, var. subcylindrica.

branches, erect or pendent, standing frequently at right angles to the axis, or as frequently reflexed to horizontally spreading: pedicels 1.5–2.5 mm. long, closely and minutely pilose: calyx about 2 mm. long, strongly pyriform, gradually broadening upward; the outer and inner sepals joined in an obconic base; the inner spatulate to elliptic-obovate and obtuse, densely and closely subappressed-pilose; the outer narrowly lanceolate, inconspicuous, much exceeded by the inner ones and joined with them high on the calyx: capsule dull, ellipsoid-ob-ovoid, about 2 mm. long, equaling to slightly exceeding the calyx; the valves blunt, somewhat indurated, considerably coalesced, in maturity separating about to the middle: seeds 1–2, dark-brown, large (1.2 mm. or more long, 0.7–0.9 mm. broad), nearly equilateral to quite irregular, mostly with a considerably enlarged basal portion, the dorsal surface strongly convex and the ventral surface concave, with a membranaceous coat in maturity.—Bull. Torr. Bot. Cl. li. 384 (1924); Small, Man. 883 (1933).— Southern peninsular Florida, on sand-hills, sand-dunes and in scrub. I have seen the following specimens. FLORIDA: scrub, near Sebastian, *Small, DeWinkeler & Mosier*, no. 11,164 (NY); scrub, on sand-hills, near Sebastian, *Small, Small & DeWinkeler*, no. 11,542 (NY); ancient sand-dunes, near Sebastian, September 6, 1922, *Small, Small & DeWinkeler* (TYPE in Herb. N. Y. Bot. Gard.); scrub, near Sebastian, *Small & DeWinkeler*, no. 9832 (NY); sand-hills about Lake Jackson, *Small, Small & DeWinkeler*, no. 10,636 (NY); in a scrub, 13 miles south of Clearwater, August 21, 1929, *H. O'Neill* (US); scrub, between Avon Park and Sebring, *Small, Small & DeWinkeler*, no. 11,494 (NY); scrub, near Kuhlman, DeSoto Co., December 13, 1920, *Small & DeWinkeler* (NY); scrub-ridge, south of Frost Proof, DeSoto Co., *Small & DeWinkeler*, no. 9591 (NY); Manatee Co., *Chapman* (Mo); scrub, near Sarasota, *Small & Matthaus*, no. 11,630 (NY); Palm Beach, July, 1932, *W. Rhoades*, no. 2 (US). PLATE 490, FIGS. 2, 3, and 4; MAP 14.

This, one of the most striking species of *Lechea*, had been quite overlooked until Small, recognizing some of its distinctive features, described it in 1924. Of its position in the genus he[1] then stated, "Technically it is related to *L. racemulosa.*" Later, however, he[2] provided a special section, "*Cernuae,*" to include it. With its broad leaves densely hairy both on the upper and on the lower surface, its shrubby habit and its peculiarly disposed fruits, having indurated capsules with valves considerably grown together, *L. cernua* is very greatly specialized. Only in the number of seeds per capsule (1 to 2) and in the great length of pedicels is it similar to *L. racemulosa;* and several other species share these characters. Without caring to make a major division for this or any other species except *L. san-sabeana*, I would,

[1] Bull. Torr. Bot. Cl. li. 384 (1924).
[2] Man. 883 (1933).

nevertheless, say that *L. cernua* is so distinct as to make obscure its relative position in the genus. In this respect it compares with *L. divaricata* and *L. san-sabeana*, both of which have modifications which, in a much less specialized condition, may be seen in but two or three other, and perhaps related, species.

12. L. CUBENSIS Leggett. Plant suffruticose, basal shoots unknown (probably lacking): fruiting stems several, low, 12–18 cm. tall, with sparsely pilose, spreading, slender branches disposed in irregular panicles and, to a considerable extent, persistent: cauline leaves narrowly linear to subulate, 3–5 mm. long, glabrous above, subappressed- to appressed-pilose beneath, caducous, thickly cloaking the branches before maturity: pedicels sparsely subappressed-pilose, 1.5–1.8 mm. long: fruiting calyx cuneate-obovoid, 1.8–2 mm. long, 1.2–1.4 mm. broad; interior sepals closely subappressed-pilose, obovate, obtuse, about 1 mm. broad, slightly exceeding the outer sepals: capsules about equaling the calyx; valves elliptic-oblong, 1.7–1.9 mm. long, 1–1.1 mm. broad: seeds 4–5, dark-brown, with dense endosperm, slightly curved, slender, slightly enlarged at the base, at least twice as long as broad, strongly convex dorsally, keeled ventrally and with one flat or concave side, the other convex or rounded.—Bull. Torr. Bot. Cl. vi. 252 (1878); Britton in Bull. Torr. Bot. Cl. xxi. 250 (1894); Grosser in Engler, Pflanzenr. iv[193]. 137 (1903).—Western Cuba, apparently very local. CUBA: sandy pine woods, La Grifa, January, 1865, *C. Wright*, no. 3518 (TYPE in Herb. N. Y. Bot. Gard.); Laguna Larga, near La Grifa, Pinar del Rio, *Ekman*, no. 18,164 (NY). PLATE 490, FIG. 5; MAP 15.

I have seen but two collections of this species both of which are somewhat fragmentary. Apparently the plant is characteristically very low and much branched. The calyces, capsules and seeds are most like those of *Lechea Torreyi* of the Florida Peninsula, the habit most like that of *L. Torreyi* var. *congesta* of broader distribution. Britton[1] says, after his description of *L. cubensis*, "this interesting species, known to me only from one collection, is placed next to *L. tenuifolia*, but the material for examination is too meagre to afford a satisfactory diagnosis." The most striking resemblance of the two is in the exterior sepals. In both these are long. In other respects, as of the fruit mentioned above, *L. cubensis* is much closer to *L. Torreyi*. The indication seems to be that most Lecheas at first had long exterior sepals and later these became reduced in many species. In the retention of fairly long exterior sepals *L. cubensis* is a primitive species of the *L. Torreyi* group. *L. tenuifolia* and its relatives have globose to

[1] Bull. Torr. Bot. Cl. xxi. 250 (1894).

broadly ovoid calyces broadest near the base. *L. cubensis*, on the contrary, has a cuneate-obovoid calyx serving to place it in quite another group of the genus, with *L. Torreyi* and its allied species.

13. L. Torreyi Leggett. Caudex mostly simple, the new shoots appearing from near the base of the plant, or extensively branched, with the new shoots from above: basal shoots in late fall or winter, resting or immediately developing, suberect, slender, simple to slightly branched, 6–10 or more cm. tall; the axis slightly spreading-pilose with short hairs: leaves dull, brownish-green, alternate, scattered, linear, acute, pilose beneath on midrib and margin, occasionally sparingly so elsewhere, glabrous above, 5–8 mm. long, 1 mm. wide or less: fruiting stems 1–several, 30–50 cm. high, branching mostly above the middle to form open or compact ovoid to subglobose panicles; the axis strongly pilose: cauline leaves dull, brownish-green, narrowly linear-elliptic, pointed, conspicuously pilose beneath mainly on midrib and margin, glabrous above, 1–2 cm. long, 1–1.5 mm. wide; rameal leaves similar but smaller, crowded, spreading: branches open and spreading-ascending to somewhat crowded and strongly ascending: ultimate fruiting branches strongly pilose, mostly straight; fruits racemose, scattered to subapproximate, maturing in early autumn: pedicels (0.5) 0.8–1.5 mm. long, densely pilose: fruiting calyx subglobose to obovoid, broadest above the middle, dark-brown to slightly ferruginous, densely pilose with short, soft, appressed to somewhat spreading cinereous hairs, about 2 mm. long, 1.6–1.8 mm. broad, exceeding and nearly or quite enclosing the capsule; inner sepals obovate-elliptic, obtuse; outer sepals about two-thirds as long as the inner: capsule ovoid, 1.5–1.7 mm. long, 1.4–1.5 mm. broad; valves firm, not greatly indurated: seeds 4–6, subequilateral and dorsiventrally compressed to inequilaterally 3-sided with one convex and one concave lateral face, 0.9–1 mm. long, less than half as broad.—Leggett ex Britton in Bull. Torr. Bot. Cl. xxi. 251 (1894), in part; Robinson in Gray, Syn. Fl. N. Am. i^{1}. 194 (1895), in part; Grosser in Engler, Pflanzenr. iv^{193}. 138 (1903), in part; Small, Fl. Se. U. S. 799 (1903), in part; Small, Man. 883 (1933), in part. *L. cinerea* sensu Leggett in Bull. Torr. Bot. Cl. vi. 247 (1878), in part; not Rafinesque. *L. cinerea* var. *Torreyi* Chapman, Fl. So. U. S. ed. 2, Suppl. 678 (1892) and ed. 3: 37 (1897).—Damp barrens and dry sandy ground, Florida, on the Atlantic and Gulf Coasts and inland. The following specimens are typical. Florida: Jacksonville, December 10, 1873, *Keeler*, in part (NY); rather moist ground, Mayport, October, 1873, *Keeler* (NY); St. Augustine or thereabouts, March, 1872, *J. Torrey* (type in Herb. N. Y. Bot. Gard.); road to Huckleberry Creek, Apalachicola, September 28, 1889, *Chapman* (Mo); camp, pine-barrens, just south of Poorhouse Landing, Apalachicola, September 20, 1889, *Chapman* (Mo); Okeechobee Prairie, Fort Bassinger to Okeechobee City, December 13, 1920, *Small & DeWinkeler* (NY); *Biltmore Herb.*, no. 4131; Mana-

tee, *Simpson, Chapman,* no. 414 (Mo); Braidentown, *Tracy,* no. 7579 (Field). PLATE 490, FIG. 6; MAP 16.

Var. **congesta,** nom. nov. Caudex simple or branching: fruiting stems often perennial, 20–40 cm. high: basal resting shoots lacking; new shoots from base of plant or from above on the perennial stems, developing without rest: plant dull-brownish-green, more densely pilose than the typical form of the species: panicles very compact, the branches crowded, strongly ascending to suberect: fruits very abundant, crowded, irregularly racemose to clustered on crooked short branches which are often sharply bent at each pedicel: calyx-lobes in maturity strongly ferruginous, giving a reddish cast to the plant in fruit; outer sepals scarcely two-thirds as long as the inner: seeds 3, equilateral, dorsiventrally compressed, elliptic-oblong, acute.—*L. cinerea* sensu Leggett in Bull. Torr. Bot. Cl. vi. 278 (1878), in part; Chapman, Fl. So. U. S. ed. 2, Suppl. 678 (1892) and ed. 3: 37 (1897); not Raf. *L. Torreyi* Leggett ex Britton in Bull. Torr. Bot. Cl. xxi. 251 (1894), in part; Robinson in Gray, Syn. Fl. N. Am. i[1]. 194 (1895); Grosser in Engler, Pflanzenr. iv[193]. 138 (1903); Small, Fl. Se. U. S. 799 (1903); Small, Man. 883 (1933).—Dry sandy areas and pine-barrens, southern North Carolina, west to southern Mississippi, south to southern Florida and British Honduras. The following are typical. NORTH CAROLINA: dry sand, west of Southport, January 30, 1922, *E. B. Bartram* (Phila). SOUTH CAROLINA: Bluffton, October 21, 1876, *Mellichamp;* Bluffton, September, 1875, *Mellichamp* (NY); Beaufort District, 1882, *Mellichamp* (US). GEORGIA: base of sand-hills of Seventeen Mile Creek, Coffee Co., R. M. Harper, no. 1436. FLORIDA: dry pine-barrens near Jacksonville, *Curtiss,* no. 5025; Jacksonville, December, 1873, *Keeler,* in part (NY); near Jacksonville, *Curtiss,* no. 4308 (Mo); dry pine-barrens, Duval Co., *Curtiss,* no. 232* (TYPE in Herb. N. Y. Bot. Gard.); Lake City, June–July, 1898, *A. S. Hitchcock* (Field); St. Augustine, May 1, 1879, *M. C. Reynolds;* St. Augustine, 1874, *Keeler;* New River, December 26, 1895, *A. S. Hitchcock* (Field); Sanford, September, 1902, *S. Rapp,* no. 3 (US); Eustis, Lake Co., *Nash,* no. 1096; Indian River, East Florida, 1874, *E. Palmer;* Manatee, *Simpson* (Mo); Tampa, August 25, 1903, *Britton & Wilson* (NY); Flatwoods, Myers, July and August, 1900, *A. S. Hitchcock,* no. 4; vicinity of Fort Myers, Lee Co., *J. P. Standley,* no. 318; Humbugus Prairie, Dade Co., *Small, Mosier & Small,* no. 6873 (NY). ALABAMA: sandy copses, near Dog River, Mobile Co., July 14, 1893, *Mohr* (US). MISSISSIPPI: Horn Island, July 14, 1899, *Tracy* (NY). BRITISH HONDURAS: dry pine-ridge, near Manatee Lagoon, *M. E. Peck,* no. 143. PLATE 490, FIG. 7; MAP 17.

There are several marked differences between *Lechea Torreyi* and the variety *congesta* which enable one immediately to set them apart. Whereas they both are strongly pilose almost all over and both are brownish-green, the former is loosely spreading-branched, with some-

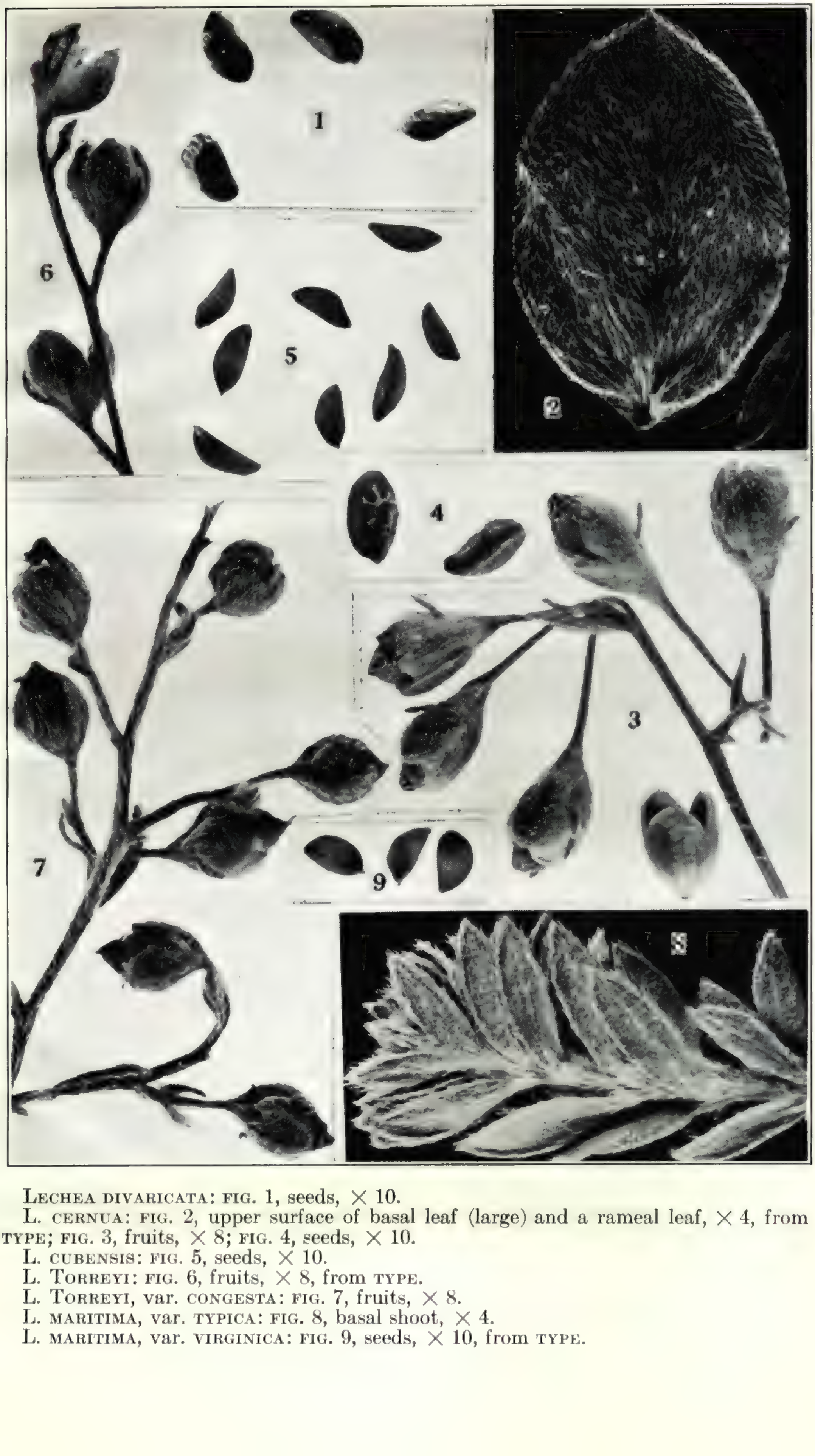
what scattered fruits, the latter compactly ascending-branched, with crowded, even clustered, fruits. The inner sepals of *L. Torreyi* are dark-brown, occasionally ferruginous, but strikingly setting off the ashy (cinereous) pilosity which, apparently, chiefly caused Chapman to use the name "*cinerea*" of Rafinesque. *L. Torreyi* var. *congesta* has its inner sepals in maturity usually markedly ferruginous, so strikingly so, in fact, as to make obscure any peculiarity in color of their pubescence. A further difference lies in the number of seeds, which is 4–6 in *L. Torreyi* and 3 in var. *congesta*.

Britton[1] states that the types are in the Columbia College Herbarium, now embodied in the collections of the New York Botanical Garden. Presumably these are the several sheets there marked *L. Torreyi*, nov. spec. These are of both *L. Torreyi* and the variety *congesta*. In recognition of the fact that the species was named for Dr. Torrey, I have selected a specimen of his collecting as the type, "St. Augustine or thereabouts, March, 1872, Dr. John Torrey" (in Herb. New York Bot. Gard.).

Leggett,[2] in discussing Rafinesque's monograph of the genus, says of the diagnosis of *L. cinerea* Raf. "This is a pretty correct description of what I have distributed to correspondents as *L. Torreyi*. However there may be two distinct forms in Florida, one 3 seeded, the other 6 seeded and the name *L. Torreyi* I have hopes may hold." Chapman[3] also used the name *cinerea*, applying it to the 3-seeded plants. In addition he described, for the first time, what he called var. *Torreyi:* "Leaves and branches spreading or recurved; capsule 6-seeded (L. Torreyi, Leggett, ined.—S. Florida)." Britton eliminated the name *cinerea* in connection with *L. Torreyi*. His *L. Torreyi*, however, included Chapman's species and variety. Inasmuch as Britton's description fails to differentiate adequately between the two and as *L. Torreyi* is not properly typified by him, it falls on me to select a type for it. This I have done, allowing Chapman's var. *Torreyi* to include the type of *L. Torreyi* Leggett ex Britton.

Lechea cinerea Rafinesque[4] is placed by that author with the group "*Menandra,*" having seeds 1–3 and external calyx of 2 short sepals. It is described as "adpressed pubescent, cinereous fastigiate; lvs. scattered, narrow linear adpressed; racemes paniculate, pauciflore,

[1] Bull. Torr. Bot. Cl. xxi. 251 (1894).
[2] Bull. Torr. Bot. Cl. vi. 250 (1878).
[3] Fl. So. U. S. ed. 2, Suppl. 678 (1892).
[4] New Fl. N. Am. i. 95 or 96 (1836).



LECHEA DIVARICATA: FIG. 1, seeds, × 10.

L. CERNUA: FIG. 2, upper surface of basal leaf (large) and a rameal leaf, × 4, from TYPE; FIG. 3, fruits, × 8; FIG. 4, seeds, × 10.

L. CUBENSIS: FIG. 5, seeds, × 10.

L. TORREYI: FIG. 6, fruits, × 8, from TYPE.

L. TORREYI, var. CONGESTA: FIG. 7, fruits, × 8.

L. MARITIMA, var. TYPICA: FIG. 8, basal shoot, × 4.

L. MARITIMA, var. VIRGINICA: FIG. 9, seeds, × 10, from TYPE.

subnaked: fls. canescent outside, sepals lanceolate acute; capsules oblong, longer." Except for the "lanceolate acute" sepals and the "oblong, longer" capsules the description might fit *L. Torreyi*. These, however, are characters of *L. patula*. It may be that, as is apparently the case with so many of Rafinesque's descriptions, he was dealing here with more than one species. In any case confusion would always arise if the name were here applied. Certainly capsules subglobose, enclosed by the calyx, as is the case in *L. Torreyi*, can never be interpreted to read "capsules oblong, longer" than the calyx.

A. A. Heller[1] mentions two specimens, one from Virginia, "at Suffolk in company with *L. racemulosa*," and the other along the North Carolina boundary, "on the southern boundary of Virginia, near Margarettsville, N. C." Both of these specimens are presumably of the *L. Leggettii* group which may resemble in habit, at least, large and openly branched specimens of *L. Torreyi*. Under *L. Leggettii* var. *ramosissima* I have cited a specimen of Heller's, "near Margarettsville, Northampton Co., no. 1128," possibly the identical plant of which he speaks. *L. Torreyi*, to the best of my knowledge, fails to get farther north than southern North Carolina.

14. L. MARITIMA Leggett. Caudex simple to multicipital, with stout often nearly erect branches: basal shoots simple, numerous and crowded to few and scattered, 3–10 cm. long; axes stout, densely pilose to subtomentose: basal leaves thick, dull-green, numerous, crowded (overlapping), often obscurely verticillate, lanceolate to elliptic-lanceolate, 3–5 times as long as broad, glabrous above, sparsely to densely pilose over the entire lower surface: fruiting stems stout, few to numerous, erect to strongly inclined: panicle evenly subpyramidal to narrowly subcylindric or decidedly one-sided, 15–35 cm. high; branches starting from near the base to above the middle: cauline leaves whorled and caducous below the panicle, alternate, approximate and mostly persistent in the panicle, narrowly oblanceolate, abruptly acute, narrowed gradually to the base, 0.7–2.5 cm. long, 1.2–4 mm. broad, during development subglabrous to conspicuously scattered-pilose on the upper, scattered-pilose on the lower surface; in maturity mostly glabrous on the upper surface and scattered-pilose on the lower: rameal leaves shorter and proportionately narrower, often crowded: fruits mostly subappressed, on secondary or tertiary branches, crowded and clustered at the tips to distinctly racemose and not crowded: flowers in late summer: stamens variable in number (6–10 or more): pedicels 1 mm. or less to 2 mm. long: calyx pyriform to broadly ovoid, 1.6–2.1 mm. long, strongly subappressed-pilose: inner sepals slightly keeled, elliptic-ovate and subacute to elliptic and

[1] Bull. Torr. Bot. Cl. xxi. 23 (1894).

acute; outer sepals much shorter than to equaling the inner: capsule 1.3–2.1 mm. long, subglobose to broadly ovoid, shorter than to equaling the calyx: seeds 2–5 (–6), light-brown, not lustrous, the surface smooth, with the embryo faintly discernible through the semitransparent endosperm, slightly inequilateral; in shape and in number per capsule variable in the species as a whole, but with fairly constant characters in each of the varieties.

a. Panicles subcylindric to broadly subpyramidal, the branches mostly from below the middle: calyx mostly pyriform to cuneate-obovoid, 2 mm. or less in length; the outer sepals inconspicuous, considerably exceeded by the inner: seeds 2–4 (–5).

Seeds 3–4 (–5), obscurely 3-sided or 2-sided and convex ventrally, 0.8–1.1 mm. (mostly 1 mm. or slightly less) in length, much less in width: panicle branching at about the middle, mostly uniformly so.....Var. *typica*.

Seeds 2, dorsally convex, ventrally flattened to slightly concave, 1–1.2 mm. (mostly more than 1 mm.) long, 0.7–0.8 mm. broad: panicle branching mostly from near the base, often 1-sided and to a considerable extent persistent to the second year.....Var. *virginica*.

a. Panicle slenderly subcylindric, the branches mostly from above the middle: calyx slightly depressed-globose, 2 mm. or slightly more in length; the outer sepals conspicuous, at times nearly equaling the inner: seeds 4–5 (–6).
Var. *subcylindrica*.

Var. **typica**. Caudex simple, unbranched and but slightly enlarged (particularly inland), or greatly thickened and multicipital (when partially or completely buried in sand), with stout, woody subprocumbent to nearly erect branches (along the Atlantic Coast in sandy areas): basal shoots procumbent to suberect, 3–10 cm. long; their leaves obscurely whorled, overlapping and crowded toward the end of the shoot, 5–10 mm. long, from one-third to one-quarter as broad, largest toward the tip of the shoot (at its base very small early leaves frequently persisting), lanceolate and acute, rounded at the base, uniformly sparsely to densely subappressed-pilose over the entire lower surface, glabrous above: fruiting stems 15–35 cm. high, branching from below the middle, forming either a dense pyramidal panicle with the lower branches long and broadly spreading and with the uppermost branches very short or a subcylindric open panicle with the lower branches not greatly exceeding the upper: cauline leaves somewhat scattered-pilose above in development: fruits of the dense panicles mostly in clusters on short secondary branches, of the open cylindrical panicles scattered along the secondary and the upper primary branches: pedicels 1 mm. or less to 1.5 mm. long: calyx pyriform to subglobose, 1.8–2 mm. long, strongly pilose; interior sepals elliptic to elliptic-ovate, acute, slightly keeled; exterior sepals narrowly lance-linear, much shorter: capsule broadly ovoid to globose, 1.3–1.8 mm. long, nearly as broad, hardly equaling the calyx; valves ovate, spreading slightly at maturity: seeds mostly 3 (rarely 2 or 5),

0.8–1.1 mm. long, 2-sided and dorsally rounded, ventrally convex or 3-sided and with 2 quite unequal and somewhat obscure lateral faces, the base enlarged, the apex subacute.—*L. maritima* Leggett in Britton, Prel. Cat. Pl. N. J. 13 (1881); Britton in Bull. Torr. Bot. Cl. xxi. 249 (1894); Robinson in Gray, Syn. Fl. N. Am. i[1]. 192 (1895); Britton in Britton & Brown, Ill. Fl. ii. 443, fig. 2478 (1897); Britton, Man. 632 (1901); Grosser in Engler, Pflanzenr. iv[193]. 138 (1903); Small, Fl. 799 (1903); Robinson & Fernald in Gray, Man. ed. 7: 578 (1908); Stone, Pl. So. N. J. ii. 563, pl. 83, fig. 4 (1911); N. Taylor, Fl. Vic. N. Y. 449 (1915); Small, Man. 883 (1933). *L. thymifolia* sensu Pursh, Fl. Am. Sept. i. 91 (1814); Torrey, Fl. N. & Mid. St. 161 (1824); Eaton, Man. ed. 3: 328 (1822); Eaton & Wright, N. Am. Bot. 294 (1830); Beck, Bot. No. U. S. ed. 1: 36 (1833); Torrey & Gray, Fl. N. Am. i. 153 (1838); Wood, Class Bk. Bot. 57 (1845); Torrey, Fl. N. Y. i. 79 (1843); Gray, Gen. Ill. i. 206, t. 88 (1848) and Man. ed. 5: 81 (1867); Leggett in Bull. Torr. Bot. Cl. vi. 251 (1878); not Michx. *L. minor* var. *maritima* Gray in Watson & Coulter in Gray, Man. ed. 6: 77 (1890). *L. maritima* var. *interior* Robinson in RHODORA, x. 34 (1908). —Sandy soil near the sea, and inland, particularly in river valleys, southern Maine and north-central New Hampshire (Crawford Notch) to Delaware, in Massachusetts and southern New Hampshire abundant, generally, on dry slopes. The varieties of *L. maritima* are geographically segregated and have well defined characters making it unnecessary to record representative material of var. *typica*. PLATE 490, FIG. 8; MAP 18.

Var. **virginica,** var. nov. Caudex crassus multicipitalis ramis saepe ad 1 dm. longis subprocumbentibus apice adscendentibus; rami basilares pauci sparse dispositi; folia basilaria saepe persistentia 4–5- plo longiora quam lata; caules fructiferi erecti vel suberecti; panicula subaequilateralis vel caule declinato inaequilateralis ramis suberectis; rami sub medio plerumque longissimi (ad 30 cm. longis) supra medium gradatim breviores; calyx late ellipsoideus vel subglobosus 1.9–2.1 mm. longus; capsula late ellipsoidea vel depressoglobosa 1.5–1.9 mm. longa 1.5–1.7 mm. lata; semina plerumque 2 dorso convexa ventre plana vel concava subaequilateralia 1–1.2 mm. longa 0.7–0.8 mm. lata.—Sandy areas near the coast in southeastern Virginia. I have seen the following specimens. VIRGINIA: sand dunes, Savage Neck, Northampton Co., *Fernald & Long*, no. 5377; Fortress Monroe, May 12, 1877, *L. F. Ward* (US); outer dunes, vicinity of Cape Henry, *E. P. Killip*, no. 6660 (NY); sand dunes, Cape Henry, *Fernald & Griscom*, no. 2856; open sands and dunes, Cape Henry, *Fernald & Long*, no. 4948; Virginia Beach, September 26 & 27, 1890, *Hollick & Britton* (TYPE in Herb. N. Y. Bot. Gard.); near Virginia Beach, *T. H. Kearney, Jr.*, nos. 1387, 2094 (US); near Ocean View, Norfolk Co., *T. H. Kearney, Jr.*, no. 1001 (US). PLATE 490, FIG. 9; MAP 19.

Var. **subcylindrica,** var. nov. Caudex simplex vel multicipitalis ramis paucis brevibus; rami basilares eis varietatis typicae similis,

folia basilaria dorso plus minusve pilosa; folia caulina supra plerumque glabra dorso subadpresse pilosa praecipue in costa et in margine; caules fructiferi pauci erecti 20–35 cm. alti; panicula anguste subcylindrica; rami supra medium breves (1–4 cm. longi); fructus aggregati vel in racemum dispositi; pedicelli 1.5–2 mm. longi; calyx pedicellos aequans vel superans ovoideus vel globosus; sepala interiora obscure carinata ovato-elliptica subacuta; sepala exteriora anguste lanceolata vel linearia interiora plus quam ¾ vel fere aequantia; capsula late ovoidea vel globosa 1.8–2.1 mm. longa calycem subaequantia; semina 3–5 (6) plerumque 4–5 dorso valde convexa ventre convexa vel carinata et aequilateralia 1–1.1 mm. longa.—Sandy coast of eastern New Brunswick and the islands of Miramichi Bay. I have seen the following specimens. New Brunswick: Fox Island, Miramichi, July 13, 1892, *J. Fowler* (US); South Beach, on grass (*Ammophila*)-plain, Richibucto, Kent Co., *S. F. Blake*, no. 5709; grass-plain, Kouchibouguac, Kent Co., *S. F. Blake*, no. 5727; sur les dunes, Buctouche, comté de Kent, *Victorin, Rolland-Germain & Jacques*, no. 44,651; grass (*Ammophila*)-plain, Portage Island, Northumberland Co., *S. F. Blake*, no. 5672 (type in Gray Herb.); grass (*Ammophila*)-plain, Fox Island, Northumberland Co., *S. F. Blake*, no. 5690. Map 20.

The type specimen of Pursh's *Lechea thymifolia*, which is in the Kew Herbarium, is of our *L. maritima* according to Britton[1] who, presumably, had seen the specimen since he wrote "This paper is, then, essentially based on the examination of type specimens."

Lechea maritima grows abundantly in almost pure sand along the coast and hence may usually be quickly identified. Often, however, it occurs inland in company with *L. villosa*, *L. Leggettii* or any other species whose range it overlaps and then there is, quite often, difficulty in identifying it. From *L. Leggettii* and *L. intermedia* it may be distinguished by its basal leaves, which are pilose all over beneath (not merely on midribs and margins as in those species) and by its seeds. These are inequilateral, smooth, light-colored, usually 3 in number and dorsiventrally thickened but not strongly angled, characters which effectively separate *L. Leggettii*, with its prevailingly dark-brown, equilateral and dorsiventrally compressed seeds, and *L. intermedia*, with its predominantly 5–6 seeds which are markedly keeled and have a conspicuously reticulate surface in maturity.

Lechea maritima has the type of variation mentioned in *L. tenuifolia*, giving rise to large-seeded and small-seeded phases unaccompanied by other important morphological differences and with no differences in geographical range nor even in habitat. However,

[1] Bull. Torr. Bot. Cl. xxi. 245 (1894).

types of ecological variations do occur which are not at all uniform. They embody slight changes in quantity of hairiness, quality of branching, color, etc. in inland plants which cause them to appear quite distinct from the usual maritime extreme. Dr. Robinson[1] described *L. maritima* var. *interior*, incorporating in it most of the inland smooth specimens of the species. He cited, as a type, his collection, "dry soil, Troy, N. H., no. 588." That a lessening in degree of pilosity is a result of growing inland is attested by the fact that in interior parts of Connecticut, Massachusetts and New Hampshire are plants differing in other vegetative characters from the Troy specimen, but alike in regard to degree of pilosity. It is safe to say, I feel, that inland forms in this particular character have become altered quite independently of other forms, and that the plants at Crowford Notch, for example, and in northern Connecticut, are more related to those of York County, Maine and to those of southern Connecticut, respectively, than to each other. In regard to degree of pubescence there is a tremendous range of variation among the plants growing near the sea thus eliminating the degree of pubescence, I believe, as an important character within the species. The variety *interior* covers, in my opinion, a number of unclassifiable forms.

Many of the specimens from Connecticut which have been placed in var. *interior* are probably hybrids between *L. maritima* and *L. Leggettii* var. *typica*. These are intermediate in most respects between the two parents; but, because of the fairly close resemblance in habit between the two, they are usually difficult to separate. Presumable hybrids between *L. maritima* and *L. villosa* are fairly common (see discussion of hybridity in introduction).

The variety *virginica* is best developed in Princess Anne and Norfolk Counties in southeastern Virginia. Many of the specimens are decidedly irregular in growth, having a strongly one-sided branching. This may be because the branches are usually perennial and often somewhat suffruticose. The persistent caudices send up shoots from any part, as do those of typical *Lechea maritima*, but the caudices themselves are more extensive and are suberect to procumbent. What appears, then, like an annual inclined stem with numerous branches, is a woody perennial axis from which the annual stems arise on the upper side. In itself this form of growth would not serve to separate a variety of *Lechea*. The same thing happens in *L. villosa*

[1] Rhodora, x. 34 (1908).

with, I believe, no varietal differences appearing. However, *L. maritima* var. *virginica* regularly produces two large seeds in a capsule as contrasted with the usual three of var. *typica*. Also, the resting shoots have narrower and more persistent leaves than in the var. *typica* and when developed the leaves are more pilose on the upper surface. The presence or lack of pubescence on the upper surfaces seems to be correlated with certain stages of development of the shoots of several species of *Lechea*. It is fairly conspicuous in var. *virginica* and has been noted and discussed by Kearney.[1] Briefly, he states that the leaves, when orthotropic, become isolateral. The leaves, usually hairy only above, become hairy on both surfaces when growing erect. It seems to me that the occurrence of this feature is too constant a factor in those species which show it to be explained completely in such a way. There is a strong inheritance-factor here as well and, like so many characters which seem to be direct responses to the environment, they act at times despite their environments.

In northeastern New Brunswick is an equally well marked variety of *Lechea maritima*, which I have named var. *subcylindrica* because of its very slender panicles. So close in superficial resemblance to *L. intermedia* is it that every sheet which I have seen has at some time been misidentified as that species by collectors and even by students of the genus. The basal leaves and seeds are generally characteristic of *L. maritima*. However, its narrowly subcylindric panicle of large fruits and its lanceolate to linear exterior sepals, which at times may nearly equal the interior sepals in length, serve to separate it as a well marked geographic variety. The *L. maritima* growing in southern Maine and central New Hampshire, as far north as Crawford Notch, simulates, in some respects, the New Brunswick plant, except that in New England no strong differences have developed, but only tendencies which reveal themselves in a great variability of certain characters.

At Bathurst, New Brunswick, forty miles to the north of the range of *Lechea maritima* var. *subcylindrica* is found *Aster subulatus* var. *obtusifolius* Fernald. Except for this station, *Aster subulatus* reaches its northeastern limit in York Co., Maine. Its offshoot several hundred miles to the northeast demonstrates variation comparable to that shown in this variety of *Lechea maritima*. Fernald & Griscom[2] further subdivide *Aster subulatus*, describing var. *euroauster*, giving

[1] Bot. Surv. Dismal Swamp Region in Contrib. U. S. Nat. Herb. v. 389, 390 (1901).
[2] Rhodora, xxxvii. 183 (1935).

the range as "eastern Massachusetts to Florida, . . . chiefly southern." The type is from that part of Virginia where *Lechea maritima* var. *virginica* is abundant. *L. maritima*, therefore, has a distribution in part, at least, quite like that of *Aster subulatus*.

Lechea maritima has generally been considered to have a more extensive range than it actually has. Small[1] gives the range as "Massachusetts to Virginia and Georgia"; and quite recently, of its range he[2] says "Coastal Plain and New England Coast, Ga. to Me." I have seen no specimens from south of Virginia on the Atlantic Coast and none inland about the Great Lakes, although Coulter[3] and Pepoon,[4] following Hill, list the species as to be found in the Chicago area near the southern end of Lake Michigan. Peattie[5] says of the species "Rare, at Miller." The very close similarity to *L. maritima* of immature plants of *L. patula* and *L. Torreyi* in the southern United States and of *L. stricta* in the Lake Michigan region undoubtedly accounts for these doubtful records.

The fact that the range of *L. maritima* is quite restricted is of considerable interest because, on the one hand, the species is strikingly successful in competition with other plants (even appearing weedy at times) and, secondly, it is one of the more distinct of our northeastern species.

15. L. STRICTA Leggett. Caudex simple; basal shoots in mid- and late autumn, numerous, short, simple, slightly crooked, subprocumbent, 2–3 cm. long; the axis strongly subappressed- to spreading-pilose or slightly villous: basal leaves obscurely verticillate or scattered, crowded, lanceolate to lance-elliptic, attenuate to base, 0.7–1.2 mm. broad, 3–5 mm. long, glabrous above, subappressed-pilose beneath on midrib and margin: fruiting stems one to several, 25–45 cm. tall; branches above the middle, strongly ascending to suberect: panicle spire-shaped to slenderly pyramidal; the axis of young stems and immature branches tomentose, in maturity becoming densely subappressed-pilose: cauline leaves abundant, subappressed, often persisting well below the panicle, narrowly oblanceolate, attenuate to the base, abruptly pointed or acute at the apex, 1.3–2 cm. long, 1.5–3 mm. broad, glabrous above, strongly subappressed- to spreading-pilose with short flexuous hairs on midrib and margin of the lower surface, frequently sparsely pilose elsewhere beneath; rameal leaves much smaller, numerous: fruits mostly crowded-racemose: pedicels strongly

[1] Fl. Se. U. S. 799 (1903).
[2] Man. 883 (1933).
[3] Fl. Pl. & Ferns of Ind. 841 (1899).
[4] Fl. Chicago Area, 390 (1927).
[5] Fl. of Ind. Dunes, 266 (1930).

pilose, equaling to exceeding the calyx: buds tomentose: calyx in fruit subglobose, equalling to exceeding the capsule, strongly pilose with somewhat spreading pubescence; outer sepals linear, not more than two-thirds as long as the inner; inner sepals ovate to obovate, obtuse, 1.6–1.8 mm. long, 1.2–1.3 mm. broad: capsule subglobose to broadly ovoid: seeds 3–4, narrowly ovate and equilateral, dorsiventrally compressed and ventrally convex or keeled and somewhat inequilateral.—Leggett ex Britton in Bull. Torr. Bot. Cl. xxi. 251 (1894); Robinson in Gray, Syn Fl. N. Am. i[1]. 193 (1895); Britton in Britton & Brown, Ill. Fl. ii. 444, fig. 2483 (1897); Britton, Man. 633 (1901); Grosser in Engler, Pflanzenr. iv[193]. 138 (1903); Robinson & Fernald in Gray, Man. ed. 7: 578 (1908). *L. minor* f. *stricta* Gray in Robinson in Gray, Syn. Fl. N. Am. i[1]. 193 (1895).—Sandy fields and woods or lake-shores and prairies, Ontario and Indiana to Minnesota and Nebraska. Ontario: sandy soil, Belleville, July, 1877, *J. M. Macoun;* vicinity of Belleville, August 3, 1876, *J. Macoun.* Indiana: sandy field, North Judson, August 29, 1894, *E. J. Hill* (Field); sandy ground, Clark, September 10, 1881, *Hill* (Field); Lake Co., *Hill* (Field). Wisconsin: Scott, Brown Co., August 6, 1899, *Schuette* (Field); Cross Plains, Dane Co., September 14, 1916, *J. R. Heddle* (Field); Dells of the Wisconsin, August, 1858, *Lapham* (NY); dry sandy slopes, near Mauston, Juneau Co., *E. J. Palmer*, no. 28,439; Camp Douglas, Juneau Co., August 13, 1891, *E. A. Mearns;* sand plain between Fountain City Slough and Waumandee Lake, Fountain City, *Fassett*, no. 3416. Illinois: beach-region, north of Waukegan and east of the glacial Glenwood Ridge, Lake Co., August 14, 1908, *F. C. Gates* (Field); edge of thicket, Evanston, August 4, 1911, *E. E. Sherff;* sandy border of woods, Cook Co., August 27, 1896, *A. Chase;* Englewood, October 27, 1881, *E. J. Hill;* northern part, October 24, 1874, *Bebb*, marked *L. stricta* provisionally nov. spec. (type in Herb. N. Y. Bot. Gard.); knolls in oak-openings, Fountaindale, Winnebago Co., 1873 & 1879, *Bebb; Bebb*, no. 2087 (with a letter of N. L. Britton to Bebb); sandstone region, Rock River, end of August 1874, *Bebb* (NY); dry barrens, near Byron, Fountaindale, Winnebago Co., 1877, *Bebb* (Field); Shirland, June 26, 1908, *Gleason;* Byron, Ogle Co., *Bebb* (Field); Oquawka, *Patterson* (Field); Oregon, September 1, 1888, *M. B. Waite.* Minnesota: Winona Co., July–October, 1897, *Holzinger* (NY); Leaf Mountain, July, 1897, *J. E. Campbell;* Lindstrom, Chisago Co., August, 1892, *B. L. Taylor* (Field); Zumbrota, Goodhue Co., August, 1892, *Ballard* (US); sandy soil, Hennepin Co., September, 1892, *Sandberg* (Field); Brainerd, August 8, 1903, *C. D. Mell* (NY); Morrison Lake, Clearwater Co., September 6, 1929, *M. L. Grant* (US); Muskoda, Red River Valley, August 12, 1901, *Ballard*, no. 3112. Iowa: Manchester, September, 1897, *C. E. Bull;* along Cedar River, Muscatine Co., September, 1892, *F. Reppert* (NY); prairies, Fayette, August, 1894, *Fink;* Jasper Co., *J. W. Preston;* Ames, November 8, 1877, *R. Burgess* (Field). Nebraska: Long Pine, August 16, 1899, *J. M. Bates.* Map 21.

LECHEA LEGGETTII, var. TYPICA: FIG. 1, fruits, × 8.
L. LEGGETTII, var. MONILIFORMIS: FIG. 2, fruits, × 8, from TYPE.
L. LEGGETTII, var. RAMOSISSIMA: FIG. 3, seeds, × 10.
L. INTERMEDIA, var. TYPICA: FIG. 4, fruit, × 8; FIG. 5, seeds, × 10; FIG. 6, tip of basal shoot, × 4.
L. INTERMEDIA, var. JUNIPERINA: FIG. 7, fruit, × 8, from TYPE; FIG. 8, tip of basal shoot, × 4.
L. INTERMEDIA, var. LAURENTIANA: FIG. 9, fruit, × 8, from TYPE; FIGS. 10 and 11, portions of basal shoots, × 4, from TYPE.
L. INTERMEDIA, var. DEPAUPERATA: FIGS. 12 and 13, entire plants, × 2/5, TYPE.

This species has been difficult to separate from its near relatives, *Lechea intermedia* and *L. Leggettii.* The extremes of variation in one or more characters of *L. stricta* may grade into either of the other two species. In addition, apparent hybrids occur with these or with *L. tenuifolia.* The consequence is that the species has been the most puzzling one of the entire genus to separate and clearly to diagnose. The fruits generally resemble those of *L. Leggettii* var. *typica,* although the calyx is densely and quite prominently spreading-pilose to subvillous and the seeds are often 4 in number and quite prominently keeled, approaching in shape, not in color or markings, those of *L. intermedia.* In shape the basal leaves are quite like those of *L. intermedia* and its varieties but are conspicuously spreading-pilose to subvillous on midrib and margin. The outstanding characteristics of *L. stricta* are the strongly appressed-ascending character of the leaves and branches and the very strong pilosity of the primary stems, branches and lower surfaces of the cauline leaves. With both of these characters there is sufficient variability for confusion to occur.

The species illustrates in general the kind of specific differentiation which takes place in *Lechea.* It differs trivially from its nearest relatives in almost all the points used to separate the species in the genus. The characters of seeds, capsules, sepals, branching, general pubescence and cauline and basal leaves together form a combination that no other species can duplicate. No characters by themselves are strongly accented in any way; neither are they definitely intermediate between those of any two other species. They represent merely a progressive tendency of the whole plant to vary in a combination of characters. Similar but less striking differences are exemplified in the cases of geographic varieties of other species which, in some instances, show more striking single departures from their closest relatives than does *L. stricta* from its related species.

Lechea stricta has the center of its distribution in and about the Driftless Area in northern Illinois, northeastern Iowa, southeastern Minnesota and in southern Wisconsin. Outlying stations occur in northern Nebraska and in northwestern Minnesota in valleys of rivers tributary to the Mississippi, and in southern Ontario. The above range can be explained fairly simply by assuming the species to have survived at least the Wisconsin stage of the Pleistocene Glaciation in the Driftless Area,[1] along with such plants as *Lespedeza*

[1] Fernald, *Persistence of Pl. in Unglac. Areas of Bor. Am.* in Mem. Amer. Acad. xv. 317, 318 (1925).

leptostachya Engelm., *Talinum rugospermum* Holzinger and *Asclepias Meadii* Torrey, and to have radiated therefrom in Post-Pleistocene time. The abundance of the plant in the area about the southern end of Lake Michigan may be correlated in a general way with the presence there of numerous species and varieties of plants found elsewhere only on the Atlantic Coastal Plain or it may be the result of migration from the Driftless Area. The station in Belleville, Ontario is impossible of explanation unless we assume that the last stage of Pleistocene Glaciation represented a much less extensive but perhaps more complicated series of events than has previously been held by many geologists.

16. L. Leggettii Britton & Hollick. Caudex mostly simple: basal shoots 3–8 cm. long, slender, procumbent to suberect; the axis subappressed-pilose with gray hairs: basal leaves verticillate to subverticillate or scattered, not at all to slightly overlapping, subappressed at base to the axis, narrowly lanceolate or oblanceolate to narrowly lance-elliptic, narrowed gradually to both apex and base, acute or pointed at apex, 4–10 mm. long, 0.8–2.5 mm. broad, glabrous above, sparsely pilose beneath on midrib and margin with appressed to somewhat spreading hairs: fruiting stems frequently one, rarely many, 25–80 cm. tall: branches mostly above the middle, few to numerous, widely spreading to ascending; panicle openly to densely subcylindric to subglobose; axes of stem and branches sparsely subappressed-pilose to glabrate: cauline leaves narrowly oblanceolate to linear, attenuately narrowed at the base to the slender (1 mm. long) petiole, 1–2 cm. long, 1.5–3 mm. broad: fruits in late summer and early autumn, scatteringly racemose, long-pedicelled and secund to short-pedicelled and clustered: pedicels slender, 1.2–2.3 mm. long, shorter than to equaling or exceeding the calyx, conspicuously subappressed-pilose: calyx subglobose to slenderly pyriform, 1.6–2 mm. long, 1.3–2 mm. broad; inner sepals prominently 3-veined, not keeled, shallowly concave, broadly ovate or obovate to narrowly obovate, obtuse, conspicuously to densely subappressed- or slightly spreading-pilose; outer sepals inconspicuous, narrowly lanceolate, about two-thirds as long as the inner: capsule subglobose to ellipsoid, 1.5–2 mm. long, 1.3–1.6 mm. broad: seeds 2–3 (4), 1–1.25 mm. long, 0.5–0.7 mm. broad, medium- to dark-brown, with the embryo distinct but not conspicuous, dorsiventrally compressed and narrowly ovate, with the base enlarged and the apex subacute or dorsiventrally thickened, keeled, obscurely 3-sided and somewhat inequilateral.

a. Panicle slenderly ovoid to subcylindric; the principal branches subequal, the ultimate branches greatly reduced, bearing crowded, frequently clustered fruits: calyx in fruit light- to dark-brown, cuneate-obovoid: seeds 3–4, 1–1.1 mm. long, frequently thickened dorsiventrally and keeled.....Var. *typica.*

a. Panicle subcylindric to subglobose; the branches diminishing upward, the ultimate branches several cm. in length, bearing racemes of scattered fruits: calyx in fruit brownish- to reddish-purple, pyriform, narrow to broad above: seeds 2–3, 1.1–1.25 mm. long, compressed dorsiventrally or 3-sided.

Fruiting stems up to 80 cm. high: panicles well above the middle, broadly and irregularly ovoid to globose: seeds mostly 2, dorsiventrally compressed and equilateral. Var. *ramosissima.*

Fruiting stems up to 60 cm. high: panicles at about the middle, subcylindric to slender-ellipsoid: calyx slenderly pyriform: seeds mostly 3, frequently inequilateral and 3-sided or dorsiventrally compressed..... Var. *moniliformis.*

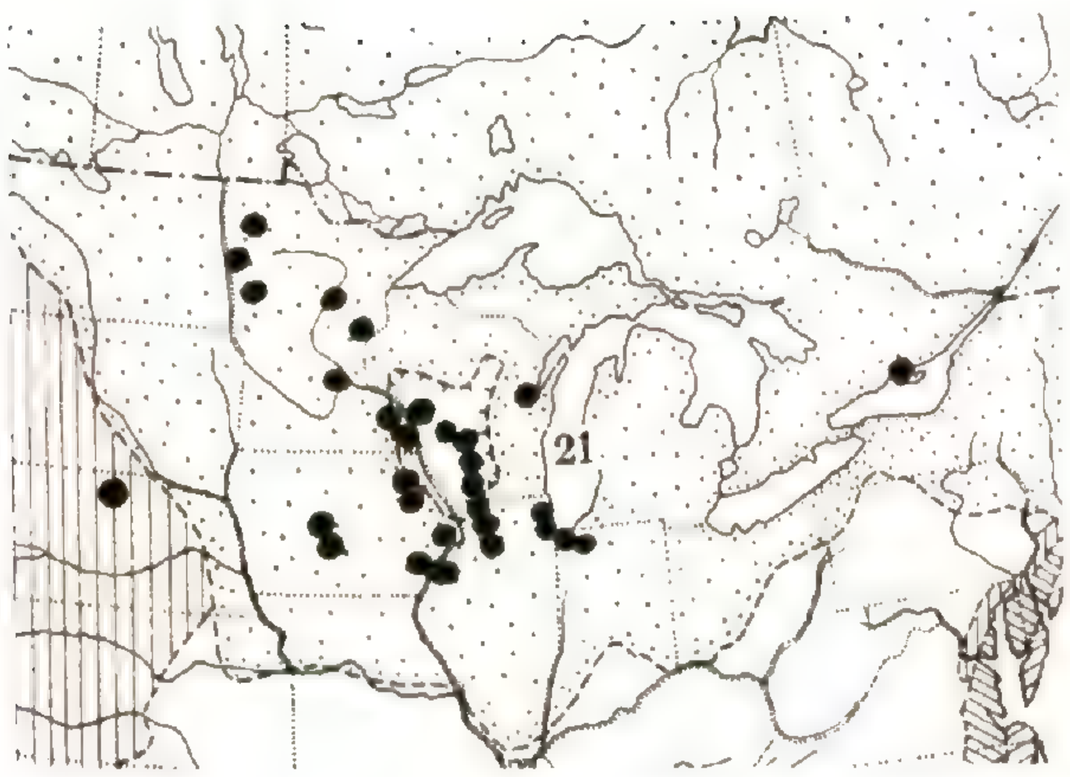
Var. **typica.** Basal leaves narrowly elliptic or oblanceolate, broadest at or about the middle, 4–8 mm. long, 0.8–1.6 mm. broad: fruiting stems 25–55 cm. high: panicle slenderly ellipsoid to subcylindric; branches at or about the middle, open to crowded, subequal, spreading, 3–8 cm. long: fruits crowded-racemose to clustered at the tips of the short ultimate branches; pedicels shorter than calyx: calyx cuneate-obovoid, 1.6–1.8 mm. long, 1.4–1.7 mm. broad, strongly pilose with fine, subappressed, gray, short hairs; interior sepals ovate to obovate, obtuse: capsule subglobose, 1.5–1.6 mm. long, hidden by the calyx: seeds 3–4, mostly 3, 1–1.1 mm. long, 0.5–0.6 mm. broad, dorsiventrally compressed and narrowly ovate or elliptic to dorsiventrally thickened and somewhat obscurely and unequally 3-sided.—*L. Leggettii* Britton & Hollick in Britton in Bull. Torr. Bot. Cl. xxi. 251 (1894); Robinson in Gray, Syn. Fl. N. Am. i[1]. 193 (1895); Britton in Britton & Brown, Ill. Fl. ii. 443, fig. 2480 (1897); Britton, Man. ed. 1: 633 (1901); Grosser in Engler, Pflanzenr. iv[193]. 138 (1903); Small, Fl. 799 (1903); Robinson & Fernald in Gray, Man. ed. 7: 579 (1908); Stone, Pl. So. N. J. ii. 562, pl. 83, fig. 5 (1911); N. Taylor, Fl. Vic. N. Y. City, 44 (1915); Small, Man. 883 (1933). *L. minor* sensu Pursh, Fl. Am. Sept. i. 91 (1814), in part; and of many early Am. authors, probably, in part; not L.—Dry woods, sterile fields, pond-shores, etc., mostly inland, eastern Massachusetts to Virginia and Ohio. The several varieties of *L. Leggetti,* although distinct enough in the major parts of their ranges, intergrade rather more than do those of any other species of the genus. For this reason, and because in the southeastern states there is a fancied resemblance (as indicated by identifications from that area) of var. *ramosissima* to one or more other species, it seems wise to include citations of representative specimens of all. Massachusetts: border of Purgatory Swamp, Dedham, July 23, 1909, *Wiegand;* dry woods, Scituate, September 13, 1914, *C. H. Knowlton;* dry sandy clearing, Lakeville, *Fernald & Long,* no. 9961; New Bedford, September 21, 1910, *Hervey;* Nonquit, Bristol Co., August 3, 1904, *Hervey;* dry woods, Chilmark, Dukes Co., *J. A. Cushman,* no. 7530. Rhode Island: sandy soil, Bold Water Point, Providence, September 7, 1906, *J. F. Collins;* dry pond-shore, Rich-

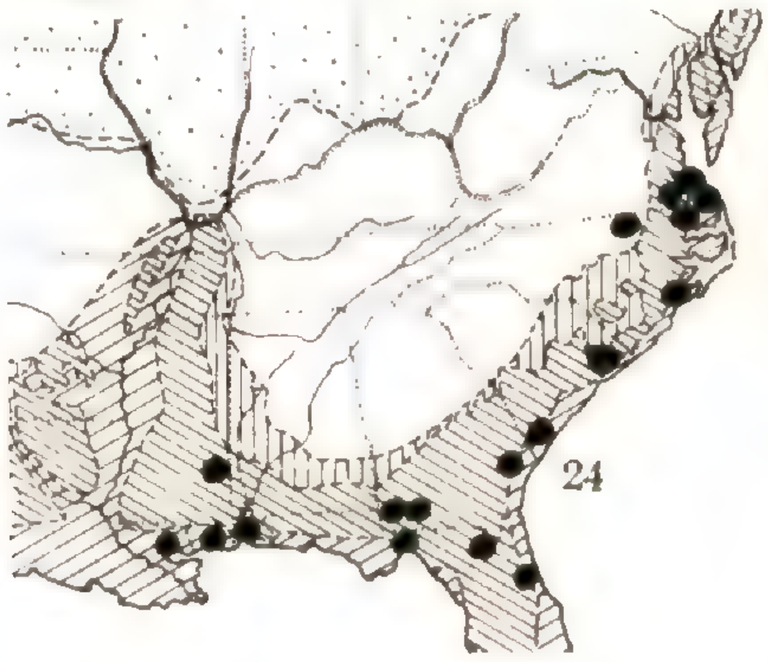
mond, Washington Co., August 30, 1919, *Fernald & Collins;* dry woods north of Ashaway, Hopkinton, Washington Co., September 1, 1919, *Fernald, Woodward & Collins.* Connecticut: damp soil, Great Oak Farm, Ledyard, August 28, 1920, *Graves & Woodward;* Groton, New London Co., September 1, 1897, *Graves;* Hartford, 1900, *H. J. Koehler;* open roadsides, Cromwell, Middlesex Co., October 16, 1919, *C. F. Batchelder;* dry barren ground, Southington, September 25, 1897, *Bissell;* near Wintergreen Lake, New Haven, October 13, 1903, *Woodward;* Trumbull, Fairfield Co., August 4, 1892, *Averill.* New York: Eaton's Neck, Long Island, September, 1887, *T. Hogg* (NY); dry ground, Lakeville, Hempstead, Long Island, September 13, 1901, *J. R. Churchill;* Staten Island, November 10, 1872, *Leggett;* Court House, New Dorp, Staten Island, September 5, 1877, *Leggett* (NY); Princes' Bay, Staten Island, October 6, 1894, *T. H. Kearney*, Jr. (NY). New Jersey: Bergen Point, October 7, 1876, *Leggett* (type in Herb. N. Y. Bot. Gard.); Monmouth Co., September 10, 1876, *Leggett;* sandy wood, Red Bank, September 10, 1875, *Leggett;* Leedsville, September 10, 1876, *Leggett.* Pennsylvania: grassy scrubby sides of a road, near Slatington, Lehigh Co., *Pretz*, no. 13,156; Buckingham Mountain, Bucks Co., July 23, 1917, *C. D. Fretz;* sandy woods, north of Malvern, Chester Co., *E. B. Bartram*, no. 1202; Jerseytown, Columbia Co., July 25, 1889, *Heller;* New Red Sandstone, South Mountain, Penryn, Lebanon Co., *Heller,* no. 502; Smithville, Lancaster Co., October 18, 1890, *Small;* barrens of Huntington Co., August, 1876, *J. R. Lowrie* (Field). Delaware: thin soil, near Wilmington, September 15, 1899, *Canby;* dry soil, Stanton, September 16, 1897, *Commons;* Harrington, 1872, *Canby* (NY). Maryland: Emmetsburg, 1828–1834, *J. Hall* (Field). Virginia: dry sandy field, Clarendon, *S. F. Blake*, no. 10,864; dry soil, Gordonsville, September 1, 1890, *F. Blanchard* (Mo); region about Mount Crawford, Rockingham Co., 1200–1500 ft. alt., *Heller & Halbach.* Ohio: Newell Ledge, Portage Co., *R. J. Webb*, no. 815. Plate 491, fig. 1; map 22.

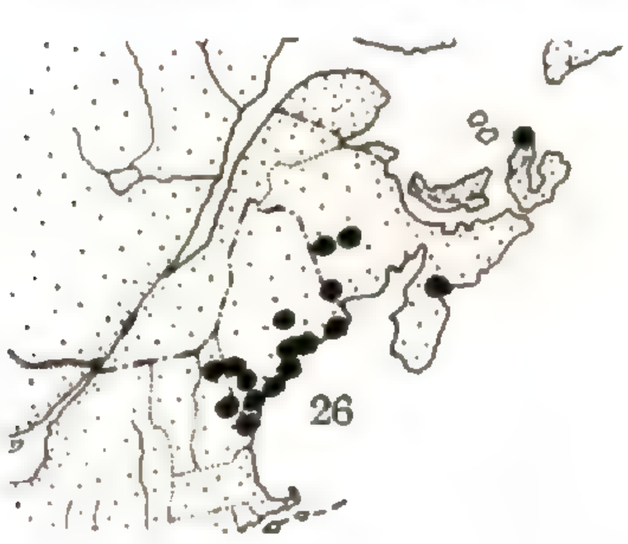
Var. **moniliformis** (Bicknell), comb. nov. Basal leaves lanceolate to lance-elliptic, 6–10 mm. long, 1.5–2.7 mm. broad: fruiting stems 25–60 cm. high: panicle slenderly and compactly cylindric-paniculate with short spreading branches to subglobose with openly spreading-ascending to erect branches; branches subequal to very unequal, 5–15 cm. long, often shorter toward the apex: fruits loosely racemose on long (several cm.) secondary or tertiary branches: pedicels 1.8–2.3 mm. long, nearly equaling to slightly exceeding the calyx: calyx reddish-purple, pyriform (often slenderly so), 1.7–2 mm. long, 1.2–1.4 mm. broad, conspicuously subappressed-pilose with rather long white hairs; interior sepals narrowly obovate, obtuse: capsule ovoid, 1.7–2 mm. long, 1.3–1.6 mm. broad, not completely concealed by and frequently slightly exceeding the calyx: seeds 2–4, mostly 3, 1.1–1.2 mm. long, 0.6–0.7 mm. broad, subequilateral, dorsiventrally compressed, broadest near the base, tapering above to the subacute or

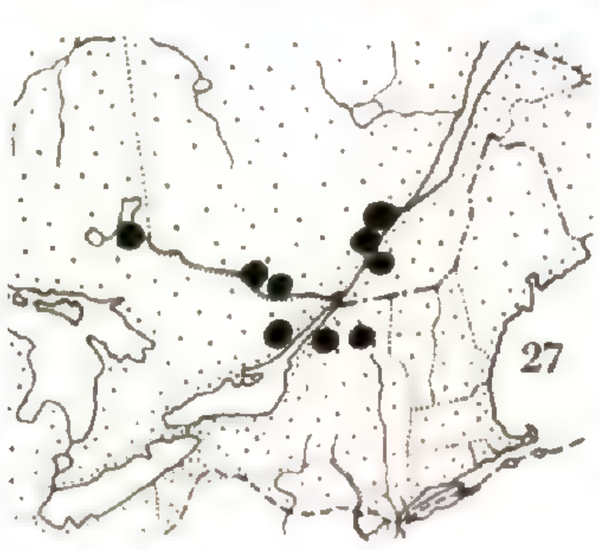
narrowly obtuse apex, or 3-sided and quite inequilateral.—*L. moniliformis* Bicknell in Britton, Man. 632 (1901); Britton in Britton & Brown, Ill. Fl. ed. 2, ii. 544 (1913).—Open woods, margins of bogs, sandy areas, frequently in damp situations. On the Atlantic Coastal Plain from Nantucket Island to southern New Jersey; in Ohio and Ontario near Lake Erie and in Indiana near Lake Michigan. The following specimens are typical. MASSACHUSETTS: Chappaquidick Island, October 5, 1911, *E. P. Bicknell* (NY); Tom Never's Head, Nantucket, August 23, 1896, *F. S. Collins;* Squam, Nantucket Island, September 18, 1899, *Bicknell* (TYPE in Herb. N. Y. Bot. Gard.); head of Tom Never's Swamp, Nantucket Island, August 31, 1904, *Bicknell* (NY). NEW YORK: East Hampton, Long Island, *Ferguson,* no. 7316 (NY); Greenport, Long Island, *Ferguson,* no. 3393 (NY); Laurelton, Long Island, *Ferguson,* no. 4706 (NY); Hempstead, Long Island, September 9, 1919, *Ferguson* (NY); low grounds, Rosedale, Long Island, October 25, 1902, *Bicknell* (NY); borders of Oak Island, in salt meadows, Woodmere, Long Island, November 6, 1906, *Bicknell* (NY); Rockville Centre bog, August 22, 1903, *Bicknell* (NY). NEW JERSEY: Closter, *C. F. Austin;* Spring Lake, July, 1834, *Lighthipe* (NY); Avon, Monmouth Co., October, 1922, *Mackenzie* (NY); dry clearings, Somers Point, *Mackenzie,* no. 7391 (NY); vicinity of Batsto, *Standley & Killip,* no. 7574; Egg Harbor, September 19, 1897, *Pollard* (NY); sandy roadside at Mullica River, Burlington Co., *F. J. Hermann,* no. 3937; open pine woods, Maple Crossway, Atsion, Burlington Co., August 10, 1926, *Benner, Long & Bassett;* Pine Barrens, near Shamong, Burlington Co., August 6, 1887, *C. F. Parker.* ONTARIO: woods, Sandwich, July 25, 1901, *J. M. Macoun,* no. 34,072a. OHIO: prairie, Oxford Springs, Erie Co., August 31, 1902, *Moseley* (US); Perkins, Erie Co., September 28, 1898, *Moseley* (US); 2¾ miles northwest of Whitehouse, Lucas Co., October 19, 1919, *Moseley;* Neapolis, Lucas Co., September 18, 1927, *Moseley.* INDIANA: shore of the pre-glacial Lake Maumee, 3 miles south of Fort Wayne, Allen Co., *Deam,* no. 14,526; dry sandy fields, North Judson, Starke Co., August 29, 1894, *E. J. Hill* (NY); dryish sands bordering sloughs, Dune Park, November 27, 1905, *Hill* (Field); moist sands, Dune Park, November 27, 1905, *Hill* (Field); Millers, Lake Co., October 1, 1881, *Hill* (NY); in a black oak woods, just west of Thayer, Newton Co., *Deam,* no. 21,395. PLATE 491, FIG. 2; MAP 23.

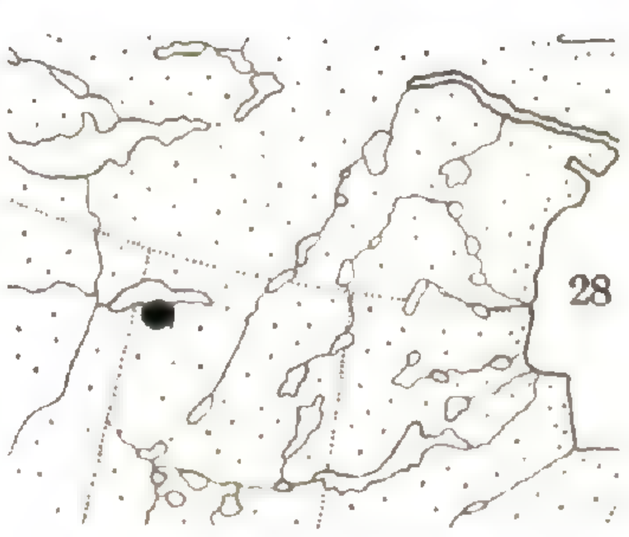
Var. **ramosissima,** var. nov. Rami basilares eis varietatis typicae similes sed pauciores; caules fructiferi 35–80 cm. alti; panicula valde supra medium caulem subdeltoidea vel globosa; rami inferiores saepe longissimi valde patuli; fructus in racemos sparsos dispositi, rami fructiferi longissimi; pedicelli calyces superantes; calyx purpureo-viridis cuneato-obovoideus 1.6–1.8 mm. longus et latus capsulam non obscurans; sepala interiora quam valvae angustiora; semina 2 (3), 1–1.2 mm. longa dorsiventraliter compressa anguste ovoidea subaequilateralia.—Open woods, sandy and peaty areas, dry or damp











MAP 21, range of LECHEA STRICTA; 22, of L. LEGGETTII, var. TYPICA; 23, of L. LEGGETTII, var. MONILIFORMIS; 24, of L. LEGGETTII, var. RAMOSISSIMA; 25, of L. INTERMEDIA, var. TYPICA; 26, of L. INTERMEDIA, var. JUNIPERINA; 27, of L. INTERMEDIA, var. LAURENTIANA; 28, of L. INTERMEDIA, var. DEPAUPERATA.

situations, Atlantic Coastal Plain, eastern Virginia to Florida, west to Louisiana. The following specimens are characteristic. VIRGINIA: border of woods, south of Melfa, Accomac Co., *Fernald, Long & Fogg*, no. 5379; bushy clearings and borders of woods, west of Hampton, *Fernald, Long & Fogg*, no. 4949; dry pine barrens, Cape Henry, *Fernald & Griscom*, no. 2854; near Virginia Beach, *T. H. Kearney*, Jr., no. 2041 (US); Virginia Beach, September 15, 1907, *Bartram & Long* (US); pine woods, Virginia Beach, *Fernald & Long*, no. 4050; damp sandy and peaty depressions back of the dunes, Rifle Range, south of Rudy Inlet, Princess Anne Co., *Fernald & Long*, no. 4048; dry woods, Creeds, Princess Anne Co., *K. K. Mackenzie*, no. 1786 (NY); dry pine woods, Macon's Corner, Princess Anne Co., *Fernald & Griscom*, no. 2855; dry pinelands about 4 miles northwest of Waverly, *Fernald & Long*, no. 6283; moist pinelands and clearings southeast of Waverly, *Fernald & Long*, nos. 7537 and 7538. NORTH CAROLINA: Edenton, Chowan Co., *Kearney*, no. 1885 (US); sandy banks, near Beaufort, *I. F. Lewis*, no. 185 (NY). SOUTH CAROLINA: damp mucky peaty open thicket, 2 miles north of Lake City, Florence Co., *Wiegand & Manning*, no. 2069. GEORGIA: damp sandy scrubby field, Liberty Co., *Wiegand & Manning*, no. 2071; rather dry pine-barrens, Thomas Co., *Harper*, no. 1177; near Brinson, Decatur Co., *Harper*, no. 1927 (US). FLORIDA: St. Augustine, winter of 1872–73, *M. C. Reynolds* (NY); Flatwoods, Lake City, Columbia Co., *Nash*, no. 2185 (NY); pine-barrens, St. Marks, *Curtiss*, no. 6847. ALABAMA: Spring Hill, August 9, 1897, *Bush*, no. 160 (NY). MISSISSIPPI: dry sandy soil, Waynesboro, October 2, 1896, *Kearney* (NY); Ocean Springs, Jackson Co., *Pollard*, no. 1109 (TYPE in Gray Herb.); Biloxi, July 23, 1897, *C. F. Baker*, no. 698 (NY). LOUISIANA: open pine land, 1 mile north of Abita Springs, Saint Tammany Parish, *F. W. Pennell*, no. 4162 (NY). PLATE 491, FIG. 3; MAP 24.

Lechea Leggettii had been included by many, perhaps most, of the American authors before Leggett in the "protean L. minor" to use the words of Britton. Its close resemblance to *L. intermedia* is shown by the fact that it was not until the appearance of Britton's monograph that they were separately described. Britton[1] cited "*Lechea minor* Lam. Tabl. Encycl. T. 52, fig. 1 (1791)" as a synonym of his *L. Leggettii*. The difficulty of assigning this to any particular species of *Lechea* has been discussed under *L. minor* and unless Britton had seen the type-specimen of Lamarck (which he does not state) it seems to me that his inclusion of it here is but a matter of guesswork. I prefer to disregard it. Britton, p. 251, states that the types of *L. Leggettii* are in the Columbia College Herbarium. These include, presumably, the specimens there assembled by Leggett, Britton and

[1] Bull. Torr. Bot. Cl. xxi. 251 (1894).

perhaps other early collectors. Practically all of them are what I call var. *typica* and consequently the selection of a type for this variety is a relatively simple matter. It is interesting to note that Bicknell,[1] speaking of *L. Leggettii*, wrote " I take to be typical of the latter the plant that I used to find among the hills and rocky outcroppings along the Hudson near New York and which, found also in New Jersey and on Staten Island, largely make up the material studied by Leggett and by Britton & Hollick."

Like *Lechea intermedia, L. Leggettii* is quite variable and to a slight extent, at least, migrating into recently glaciated territory inland from the Coastal Plain.

Lechea Leggettii var. *moniliformis* comprises the greater part of the species on Nantucket Island, Long Island, in southern New Jersey and around Lake Erie and Lake Michigan. It is characterized by the possession of basal leaves larger and broader than in the var. *typica*, by having the fruits disposed evenly in racemes (not usually crowded or condensed towards the tips of the branches as in the var. *typica*), and by having the calyx much longer than broad and distinctly pyriform and purplish in color (not cuneate-obovoid and brownish-green as in the var. *typica*). Bicknell[1] says of this variety "The type specimens, as well as others like them from Long Island, mark a pronounced departure from typical *L. Leggettii*. Other specimens from Nantucket and Long Island are less distinctive and I am in doubt whether it is well to rate the plant as other than a variety of the common species. Nevertheless, it has points of distinction which need no second glance to impress anyone who may be familiar with the common inland form of the species, for *L. moniliformis* would appear to be a plant of the coastal plain . . . Moreover it shows this difference in habit from the more inland plant of dry open places and hilly ground, that it is of low grounds often of wet and brackish soils. A better knowledge may show that its distinctive name should be restored, but for the present let it be merged with *L. Leggettii*." In further support of this plant being a good variety is the fact that practically all of the specimens from northern Ohio, near Lake Erie, and from near the southern end of Lake Michigan in Indiana have the characters belonging to it. The plants of these areas, particularly of that at the southern end of Lake Michigan, frequently show a strong relation to or identity with the flora of the Coastal Plain. Bicknell

[1] Bull. Torr. Bot. Cl. xl. 619 (1913).

was prone to make too much of slight differences between Lecheas. His *L. juniperina*, which after much field- and laboratory-study, I regard as a strong geographic variety, differing in several details from the species, is an example of his view of what constitutes a species. When, as in this instance, he felt that there was much intergrading between *L. Leggettii* and his *L. moniliformis* he combined the two rather than make a formal variety of the latter.

The decidedly disrupted distribution along the Coastal Plain and the considerable segregation of the Great Lakes area indicates a considerable age for the variety and a segregation and isolation since the downwarping of the northern Coastal Plain.

The widely distributed var. *ramosissima* of the Coastal Plain from Virginia to Florida and west to Louisiana is more nearly related to var. *moniliformis* than to var. *typica*. It differs from the former in having a less elongate calyx and a more broadly branched habit and typically 2, rather than 3, seeds in a capsule, differences which serve to separate it as a geographic variety. In habit the plant is rather close to *L. Torreyi* which, of course, is easily distinguished by the strong gray pilosity on the calyces and by the 4–6 seeds.

17. L. INTERMEDIA Leggett. Caudex mostly simple: basal shoots in late August to November, subprocumbent to assurgent, 2–7 (commonly 3–5) cm. long; the axis sparsely to densely subappressed-pilose: basal leaves elliptic- to oblong-lanceolate, sparingly to inconspicuously subappressed-pilose on midrib and margin on the lower surface, glabrous on the upper, 3–7 (–8) mm. long, 0.8–2 mm. wide, 2-ranked and mostly in one plane, parallel to the ground or broadly spreading from all sides of the shoot, scattered or subverticillate to verticillate: fruiting stems one to many, 15–60 cm. high, branching mostly above the middle, often in the upper third: panicles narrowly subcylindric to spire-shaped; branches short, openly spreading-ascending, 2–8 cm. long or crowded and strongly ascending to suberect: cauline leaves oblanceolate, abruptly acute to pointed, 1–2.5 cm. long, 1.5–4.5 mm. broad, glabrous on the upper surface, with short subappressed prominent to inconspicuous hairs on the midrib and margin on the lower surface; rameal leaves similar but smaller and more narrowly lanceolate: axes of stem and branches finely subappressed-pilose: fruits secund or clustered at the tips of the branches: pedicels sparsely subappressed-pilose with very short hairs, 1.5–3 mm. long, of the clustered fruits frequently shorter: calyx prominently appressed-pilose, ovoid to globose and somewhat pyriform or depressed-globose, 1.9–2.3 mm. broad, 1.9–2.1 mm. long; the interior sepals not keeled, 3–5-nerved, ovate, obtuse, about as broad as long, or 3-nerved, elliptic, subacute and longer than broad; outer sepals inconspicuous, linear, from one-

half to three-quarters as long as the inner: stamens of an indefinite number; capsule broadly ovoid to depressed-globose, 1.9–2 mm. long, 1.8–2.1 mm. broad: seeds pale- to medium-brown, when mature with a thin membranaceous coat mostly adhering closely but in places drawn away, forming a reticulum, 4–6 in number, 1.1–1.3 mm. long, 0.6–0.75 mm. broad, 3-sided and prominently angled, considerably broadened and thickened toward the base or with base and apex similar, the dorsal surface strongly convex, the two lateral faces nearly flat, subequal to quite unequal, converging sharply in a straight keel.

a. Calyx and mature capsules depressed-globose; the capsule conspicuous, equaling to exceeding the calyx: interior sepals broadly ovate, obtuse or subobtuse, 5–3-veined: panicles mostly openly branched: capsules opening in mid- to late autumn..... Var. *typica.*

a. Calyx and mature capsules globose to broadly ellipsoid: calyx slightly pyriform, exceeding the capsule: interior sepals elliptic-ovate and subacute, 3-veined: plants densely and closely branched: capsules opening in early autumn....*b.*

b. Fruiting stems suberect to erect, more than 12 cm. long. Basal leaves sparsely subappressed- to spreading-pilose on midrib and margin beneath from the first, becoming nearly or quite glabrous on the margin, the midrib remaining slightly pilose, frequently 4-ranked, in conspicuous approximate to remote whorls, elliptic-lanceolate, uniformly narrowed to the acute apex and base, 3 (frequently) to 5 times as long as broad. Var. *juniperina.*

Basal leaves at first strongly subappressed to spreading-pilose beneath, retaining a prominent pilosity on midrib and margin, mostly 2-ranked in crowded obscure whorls or scattered, lanceolate to oblanceolate, more than 4 times as long as broad..... Var. *laurentiana.*

b. Fruiting stems decumbent to arched-ascending, less than 12 cm. long..... Var. *depauperata.*

Var. **typica.** Basal shoots 2–6 cm. long, mostly subprocumbent; the axis strongly subappressed-pilose: basal leaves oblong to lanceolate, acute, abruptly narrowed at base and apex, mostly dull-green, conspicuously subappressed- to spreading-pilose on the lower surface on midrib and margin, 3–7 (–8) mm. long, about one-fourth as broad, spreading mostly in one plane, subverticillate, whorled or scattered but appearing as though 2-ranked and not whorled: fruiting stems one to several, 15 cm. (occasionally in one-year plants) to 60 cm. tall; the branches spreading-ascending, 3–8 cm. long: panicles open, subcylindric: fruits scattered along the primary or secondary branches or loosely clustered toward their tips: cauline leaves spreading, those below the inflorescence falling early: pedicels 1.5–3 mm. long: calyx of the fruit mostly depressed-globose, broadest near the base, 2.1–2.3 mm. broad, about 2 mm. long; inner sepals broadly ovate, obtuse; capsule exceeding the calyx, 1.9–2 mm. long, 2–2.1 mm. broad: seeds 4–6 (mostly 5–6), 1.1–1.2 mm. long, about 0.6–0.7 mm. broad, broad-

ened and thickened toward the base, the two lateral faces unequal, that appressed to the dissepiments slightly rounded.—*L. intermedia* Leggett in Britton in Bull. Torr. Bot. Cl. xxi. 252 (1894); Robinson in Gray, Syn. Fl. N. Am. i[1]. 193 (1895); Britton in Britton & Brown, Ill. Fl. ii. 444, fig. 2481 (1897); Britton, Man. 633 (1901); Grosser in Engler, Pflanzenr. iv[193]. 139 (1903); Robinson & Fernald in Gray, Man. ed. 7: 578 (1908); Victorin, Fl. Laurent. 271 (1935), in part. *L. minor* sensu Pursh, Fl. Am. Sept. ii. 91 (1814), at least in part; sensu Hooker, Fl. Bor. Am. i. 72 (1830); sensu Watson in Gray, Man. ed. 6: 77 (1890), in part; not L.; probably *L. minor* of most other early Am. authors, in part, not L. *L. Leggettii* var. *intermedia* Britton & Hollick, Prelim. Cat. Pl. N. J. 6 (1888), name only.—Dry open woods and sterile fields, Prince Edward Island and Nova Scotia to the mountains of Virginia, west to Minnesota, the Black Hills of South Dakota and northern Nebraska (along the Atlantic slope mostly inland). The inclusion of the following citations from New Brunswick, Nova Scotia, Maine and New Hampshire, where their ranges may coincide, will serve to make more clear the distinctions between var. *typica* and var. *juniperina*. It is unnecessary to cite material from west and south of the range of the latter. NEW BRUNSWICK: Kent Co., July 22, 1870, *J. Fowler;* Kouchibouguac, October 6, 1873, *Fowler;* Escuminac, Miramichi, August 11, 1894, *Fowler* (US). NOVA SCOTIA: Boylston, July, 1890, *C. A. Hamilton*, no. 18,304; dry barren hillsides, Kentville, Kings Co., August 22, 1902, *Fernald;* near Mahone Bay, autumn of 1891, *Hamilton*, no. 18,431; dryish open sand plains, Middleton, Annapolis Co., *Fernald, Pease & Long*, no. 21,890; dry rocky or gravelly barrens, near Clement Pond, Barrington, Shelbourne Co., *Fernald, Long & Linder*, no. 21,894; dry rocky barrens, Pubnico, Yarmouth Co., *Fernald, Long & Linder*, no. 21,895. MAINE: gravelly bank, Veazie, Penobscot Co., August 19, 1897, *Fernald;* dry thicket, Milford, Penobscot Co., *Fernald & Long*, no. 14,122; Schoodic Peninsula, *Redfield*, no. 15,327 (Mo); Mount Desert, August 20, 1897, *E. P. Bicknell* (NY); among blueberry bushes, Blue Hill, Hancock Co., *A. R. Hodgdon*, no. 689; Deer Isle, Deer Island, Hancock Co., *Hodgdon*, no. 694; roadside, Camden, August 9, 1902, *G. G. Kennedy;* Cumberland, September 25, 1858, *J. Blake* (Field); York Harbor, August 21, 1896, *Bicknell;* damp roadside, South Berwick, *Hodgdon*, no. 478. NEW HAMPSHIRE: dry sandy bank, Dalton, Coos Co., *A. H. Moore*, no. 4366; sand plain, South Tamworth, Carroll Co., *Hodgdon*, no. 505; Holderness, October 8, 1886, *E. & C. E. Faxon;* sandy river terraces above Plymouth, Grafton Co., *Fernald*, no. 11,809; white pine woods, Milton, Strafford Co., *Hodgdon*, no. 687; lichen barrens in open pine woods, near Piscataqua River, *Hodgdon*, no. 700; Heniker, *B. L. Robinson*, no. 900; Jaffrey, *Robinson*, no. 44. The TYPE in Herb. N. Y. Bot. Gard. is the specimen of *T. C. Porter*, Pocono Mountain, Monroe Co., August 23, 1859. PLATE 491, FIGS. 4–6; MAP 25.

Var. JUNIPERINA (Bicknell) Robinson. Basal shoots in August and early September; the axis sparingly subappressed- to spreading-pilose: basal leaves mostly 4-ranked, elliptic-lanceolate, acute, 3–4 times as broad as long, bright-green, sparsely subappressed-pilose beneath mostly on the margin: branches of the inflorescence crowded, often strongly ascending, forming, often, a dense spire-like inflorescence: fruits mostly crowded on the upper halves of branches; calyx subglobose to slightly pyriform, broadest at about the middle: sepals ovate to elliptic-ovate, subacute, exceeding the capsule: capsules subglobose; valves oblong-ovate, broadly spreading in maturity: seeds 5–6, slightly enlarged at the base, nearly equilateral, 1–1.1 mm. long.—*L. juniperina* Bicknell in Bull. Torr. Bot. Cl. xxiv. 88 (1897); Britton in Britton & Brown, Ill. Fl. ii. 444, fig. 2482 (1897); Britton, Man. 633 (1901); Britton in Britton & Brown, Ill. Fl. ed. 2, ii. 545, fig. 2921 (1913).—Open woods and fields in poor soil, Cape Breton Island to southern New Hampshire, near the sea or in river-valleys, particularly abundant on headlands and islands of the Maine Coast. NEW BRUNSWICK: Grand Lake, September 16, 1879, *J. Fowler;* by the St. John River, Upper Queensbury, York Co., *Fernald & Pease*, no. 25,182; dry soil, St. Andrews, August 22, 1909, *A. B. Klugh*, no. 14. NOVA SCOTIA: sand dunes, Dingwall, Cape Breton Island, *G. E. Nichols*, no. 1897; dry rocky barrens, Armdale (Dutch Village), Halifax Co., *Fernald, Bartram & Long*, no. 24,171. MAINE: gravel and ledges, Pushaw Bridge, Oldtown, Penobscot Co., September 18, 1897, *Fernald;* dry field, Newburg, September 7, 1904, *O. W. Knight*, no. 92; dry sand, Strong, Franklin Co., August 13, 1901, *C. H. Knowlton;* Gilead, August 7; 1897, *K. Furbish;* Screw Auger Falls, Grafton Notch, July 26, 1895, *E. F. Williams;* Roque Bluff, Washington Co., August 28, 1924, *C. H. Knowlton;* blueberry-barrens, Machias, Washington Co., *A. R. Hodgdon*, no. 692; roadsides, Northeast Harbor, Mount Desert Island, *Redfield*, no. 16,066 (NY); Blue Hill, Hancock Co., *Hodgdon*, no. 690; Stonington, Deer Island, Hancock Co., *Hodgdon*, no. 695; Matinicus, Knox Co., *C. A. E. Long*, no. 81; dry ground, Monhegan Island, Lincoln Co., August 27, 1921, *J. R. Churchill* (Mo); Sawyers Island, Boothbay, Lincoln Co., *Hodgdon*, no. 486; sterile, rocky field, Pemaquid, *Hodgdon*, no. 487; sandy soil, Auburn, July, 1898, *E. D. Merrill* (NY); sandy barren, Cape Popham, Sagadahoc Co., August 6, 1894, *Fernald;* damp, rocky roadside, Harpswell, *Hodgdon*, no. 484; Deering, October 7, 1878, *G. E. Davenport* (NY); meadow, near Fortune Rocks, Biddeford, August 26, 1899, *G. G. Kennedy;* downs, near the sea, York Harbor, August 13, 1892, *Bicknell;* in white sands on the shore, York Harbor, August 19, 1894, *Bicknell* (part of TYPE) (NY); York Harbor, August 23, 1894, *Bicknell* (part of TYPE) (NY); dry sterile field along highway, Wells, *Hodgdon*, no. 467; sandy roadside, toward Berwick, North Berwick, *Hodgdon*, no. 470. NEW HAMPSHIRE: Shelburne, October 11, 1902, *W. Deane;* gravelly soil, Prospect Ledge, Gorham, *A. H. Moore*, no. 4273; dry

sterile soil, Dover Point, Dover, Strafford Co., *Hodgdon*, no. 499; summit, Mount Major, Alton, *H. E. Sargent*, no. 36; dry roadside, Exeter, Rockingham Co., *A. S. Pease*, no. 14,028; roadside near sea, Rye, Rockingham Co., *Hodgdon*, no. 724. PLATE 491, FIGS. 7 and 8; MAP 26.

Var. **laurentiana**, var. nov. Folia ramorum basilarium obscure verticillata vel alternata plerumque dense disposita lanceolata vel anguste oblanceolata, plus quam 4-plo longiora quam lata, costa et margine subtus valde pilose pilis subadpressis vel patulis; panicula anguste subcylindrica compacta; rami breves valde ascendentes; fructus glomerati vel in racemum densum dispositi; calyx subpyriformis capsulam ovoideam vel subglobosam superans; sepala elliptico-ovata subacuta.—*L. intermedia* Victorin, Fl. Laurent. 271 (1935), in greater part.—Dry, mostly sandy soil, open woods, river-banks and lake-shores, valleys of the upper St. Lawrence and Ottawa Rivers and along the tributaries of the St. Lawrence River in New York and Ontario. QUEBEC: sur les grands plateaux de sable, près des Trois Rivières, Les Forges, *Victorin*, no. 18,530; sand plains northwest of Three Rivers, Cap Magdaleine, Champlain Co., August 1, 1923, *Chamberlain & Knowlton;* champs sablonneux abandonnés, Saint-Joseph-de-Sorel, *Victorin*, no. 28,080; along railroad, vicinity of Longueuil, *Victorin*, no. 8319 (TYPE in Gray Herb.); les Grèves, sur les sables à la lisière du bois, De Verchères, Contrecoeur Co., *Victorin & Rolland-Germain*, no. 33,922; sur les sables du terrain de la pépinière, Berthier, *Victorin & Rolland-Germain*, no. 44,615; rivage du Lac Lapêche, Wakefield, *Rolland-Germain*, no. 25,235; shores of Ottawa River, Blueberry Point, Aylmer, *Rolland-Germain*, no. 6223; Lac McGregor, environs d'Ottawa, *Victorin*, no. 10,117; Waltham, Comté de Pontiac, *Victorin, Rolland-Germain & Mellieur*, no. 44,049. NEW YORK: on Cambrian (Potsdam) sandstone or Aridondack gneiss, Narrows Island, Black Lake, St. Lawrence Co., *Fernald, Wiegand & Eames*, no. 14,393; sandy shore, Long Lake, Hamilton Co., *House*, no. 18,509. ONTARIO: Petawawa, Comté de Renfrew, *Victorin, Rolland-Germain & Meilleur*, no. 45,364; dry cliffs, Cattle Island, Temagami Forest Reserve, *W. R. Watson*, no. 1276; near Smuggler's Cove, Leeds Co., September 4, 1905, *E. P. Bicknell* (NY). PLATE 491, FIGS. 9–11; MAP 27.

Var. **depauperata**, var. nov. Caules fructiferi numerosi decumbentes vel arcuato-ascendentes 3–12 cm. longi ramosi vel simplices, rami valde ascendentes vel adpressi 1–3 cm. longi; rami steriles basilares numerosi brevissimi 0.5–2 cm. longi; folia 1.5–3 mm. longa late aut anguste lanceolata vel oblanceolata acuta; folia caulina brevissima dense disposita subadpressa oblanceolata 5–7 mm. longa 0.8–1.5 mm. lata; fructus pauci pyriformes.—Represented by a single collection from western Canada. SASKATCHEWAN: in old burn, open woods of small Jack Pines, near Archibald River, south shore of Lake Athabasca, July 31, 1935, *H. M. Raup*, no. 6745 (TYPE in Gray Herb.). PLATE 491, FIGS. 12 and 13; MAP 28.

Lechea intermedia Leggett was included in the broadly interpreted *L. minor* from the time of Linnaeus until Leggett and Britton[1] separated it. Britton has discussed the problem of typification of *L. minor* L. The generalized and meagre descriptions of the American authors following Linnaeus and to the time of Leggett served to separate *L. minor* (*L. thymifolia* Michx.), *L. villosa* and usually *L. tenuifolia* and *L. racemulosa*. The somewhat similar, probably closely related, eastern species, *L. intermedia*, *L. Leggettii* and *L. maritima*, and occasionally *L. racemulosa* and *L. tenuifolia*, were, during this time, placed together as the polymorphic species, *L. minor*. There is virtually nothing in the descriptions of any of the earlier authors to enable one exactly to place a specimen of any of the first three. Hooker,[2] obviously by the range given, had *L. intermedia* at hand but the description does not prove it. Robinson[3] states that the *L. minor* Lam. "is a poor and dubious sketch." My own study of the figure leaves me with an equally indefinite idea of what Lamarck meant. It is best to drop this from the synonymy of any of the species of the genus.

Lechea intermedia var. *juniperina* was proposed as the species *L. juniperina* by Bicknell in 1897.[4] He studied it particularly in the immediate vicinity of York, Maine, and made numerous collections from there. He noted some rather striking differences between it and typical *L. intermedia*, despite the fact that he had, presumably, never seen var. *juniperina* as it occurs in late autumn when fully mature and with its most outstanding characteristics revealed. Late in the fall, when the capsules are completely ripe and their valves separate and spread very broadly, this variety, as I have seen it along the coast from Penobscot Bay to southern New Hampshire appears to be distinct enough, at times, to justify Bicknell's evaluation of it. The numerous intergrades, however, between it and typical *L. intermedia*, and the fact that, until nearly complete maturity, the two are hardly separable, except by minute and obscure characters, compel me to regard *L. juniperina* as a variety of *L. intermedia*. The presence of like characters (similarity in shape, number and markings) in seeds of both is the most convincing proof, to me, of their close relationship.

The most important diagnostic characters are, the narrowly ovate and acute to subacute interior sepals, the globose capsule which is ex-

[1] Bull. Torr. Bot. Cl. xxi. 252 (1894).
[2] Fl. Bor. Am. i. 72 (1830).
[3] Gray, Syn Fl. N. Am. i[1]. 193 (1895).
[4] Bull. Torr. Bot. Cl. xxiv. 88 (1897).

ceeded by the sepals and the narrowly lance-elliptic and usually bright-green basal leaves which on the lower surface are but sparsely pilose on midrib and margin or nearly glabrous. Typical *Lechea intermedia* has broader and more obtuse sepals which are about equal to or shorter than the depressed-globose capsule and darker green (often purplish) and decidedly oblong basal leaves.

On the headlands and islands of the Maine Coast this variety is decidedly abundant, occurring frequently in pure stands. Inland it appears in mixed colonies with *L. intermedia* var. *typica*. Whereas the latter occurs mostly as scattered individuals, the var. *juniperina* grows mostly in dense colonies, either in open woods or along roads where it is particularly abundant.

The variety *laurentiana*, though closely resembling in habit *L. intermedia* var. *juniperina*, differs from it by having the more crowded and frequently narrower lanceolate to oblanceolate leaves prominently pilose beneath on midrib and margin, approaching in these respects *L. intermedia* var. *typica*. From the latter it differs markedly, however, in having the calyx exceeding the capsule. As in *L. intermedia* var. *juniperina*, the capsules are ovoid or subglobose, rather than slightly depressed-globose. The seeds, moreover, are somewhat narrower and less enlarged basally than those of the var. *typica*.

In the summer of 1935, Dr. H. M. Raup discovered a new area for *Lechea* several hundred miles north of the nearest recorded station for the genus (at or near Lake Winnipeg[1]). So different in appearance are his numerous specimens from what we expect in our latitude that a close study of the fruit was necessary to establish their relationship in the genus. Dissection of the fruit shows the seeds to have the membranaceous covering present at maturity in *L. intermedia* and its varieties and not found elsewhere in the genus, except in some localized species of Florida.

The most striking characters of this northwestern variety are the extreme dwarfness of the vegetative parts and the great reduction in number of flowers and fruits. The fruiting stems, in fact, average only a few cm. in height and seem to be but little more than exaggerated basal shoots ascending at the tips and bearing fruits either along the principal axes or on very short branches. The cauline leaves are persistent until maturity to the base and there grade into the basal leaves. There is not the abrupt transition from basal to cauline leaves that one finds elsewhere in the species.

[1] Hooker, Fl. Bor.-Am. i. 72 (1830).

The calyces are rather more densely appressed-pilose than in the other varieties and with a yellowish-white rather than a white or grayish-white pilosity. The color of the hairs on the calyces of the various species of *Lechea* vary slightly but, insofar as slight difference may be seen, they seem to hold fairly well in a given species. Dr. Raup tells me that the burned-over area now supporting a young Jack Pine forest, in which the specimens of *Lechea* were found, is perhaps a square mile in extent. Not even the largest specimens from this area approach in size the very smallest specimens of *Lechea* that I have seen in New England. Most of the capsules had attained their mature proportions but their seeds were largely in an immature state at the time of collecting. The very few capsules which had mature seeds showed only 3–5 of them, hardly, however, giving a fair indication of the average.

EXPLANATION OF PLATES

(Fruiting parts, × 8; seeds, × 10; basal shoots, × 4)

PLATE 488. LECHEA SAN-SABEANA (Buckl.) Hodgdon: FIG. 1, mature fruit, capsule and dissepiments, from Hempstead, Texas, *E. Hall*, no. 31; FIG. 2, seeds from no. 31; FIG. 3, TYPE-SPECIMEN, × 1/5, from San Saba County, Texas, *Buckley*.

L. VILLOSA Ell., var. TYPICA: FIG. 4, cluster of fruits from West Roxbury, Massachusetts, October 9, 1885, *E. Faxon;* FIG. 5, individual fruits and separate capsules from the same plant as fig. 4; FIG. 6, seeds from the same plant.

L. VILLOSA, var. MACROTHECA, n. var.: FIG. 7, cluster of fruits from Cleo Major County, Oklahoma, *G. W. Stevens*, no. 1728 (TYPE); FIG. 8, seeds from the TYPE.

L. RACEMULOSA Michaux: FIG. 9, seeds from Atsion, New Jersey, *F. J. Hermann*, no. 3942.

PLATE 489. L. MENSALIS, n. sp.: FIG. 1, TYPE, × 2/5, from Chisos Mountains, Texas, *C. H. Mueller*, no. 8102; FIG. 2, branch with fruit from TYPE; FIG. 3, capsules from TYPE; FIG. 4, seeds from TYPE.

L. TENUIFOLIA Michaux: FIG. 5, branch with fruits, and one separated capsule, from Ashaway, Washington County, Rhode Island, September 1, 1919, *Fernald, Woodward & Collins;* FIGS. 6 and 7, seeds from the same collection.

L. TENUIFOLIA var. OCCIDENTALIS, n. var.: FIG. 8, fruits and capsule, from Pottawatomie County, Kansas, *J. B. Norton*, no. 80 (TYPE); FIG. 9, seeds from TYPE.

L. DECKERTII Small: FIG. 10, branch with fruits, from Lemon City, Dade County, Florida, July, 1926, *R. F. Deckert* (TYPE).

L. TRIPETALA (Moç & Sess.) Britton: FIG. 11, seeds from Rio Blanca, near Guadalajara, Jalisco, *Pringle*, no. 5171.

PLATE 490. L. DIVARICATA Shuttleworth: FIG. 1, seeds from Eau Gallie, Indian River, Florida, *Curtiss*, no. 5709.

L. CERNUA Small: FIG. 2, upper surface of basal leaf (large) and a rameal leaf (small), from near Sebastian, Florida, *Small, Small & DeWinkeler* (TYPE); FIG. 3, branch with fruits, from TYPE; FIG. 4, seeds from near Kuhlman, De Soto County, Florida, December 13, 1920, *Small & DeWinkeler*.

L. CUBENSIS Leggett: FIG. 5, seeds, from La Grifa (Pinar del Rio), Cuba, *C. Wright*, no. 3518 (TYPE).

L. TORREYI Leggett: FIG. 6, branch with fruits, from St. Augustine, Florida, March, 1872, *John Torrey* (TYPE)

L. TORREYI, var. CONGESTA, n. var.: FIG. 7, branch with fruits, from Duval County, Florida, *A. H. Curtiss*, no. 232*

L. MARITIMA Leggett, var. TYPICA: fig. 8, basal shoot from Forest Hills, Massachusetts, October 9, 1885, *E. & C. E. Faxon.*

L. MARITIMA, var. VIRGINICA, n. var.: FIG. 9, seeds from Virginia Beach, Virginia, September 26 and 27, 1890, *Hollick & Britton* (TYPE).

PLATE 491. L. LEGGETTII Britton & Hollick, var. TYPICA: FIG. 1, branch with fruits, from Slatington, Lehigh County, Pennsylvania, *Pretz*, no. 13,156.

L. LEGGETTII, var. MONILIFORMIS Bicknell: FIG. 2, branch with fruits, from Squam, Nantucket Island, Massachusetts, September 18, 1899, *Bicknell* (TYPE).

L. LEGGETTII, var. RAMOSISSIMA, n. var.: FIG. 3, seeds from Ocean Springs, Mississippi, *Pollard*, no. 1109 (TYPE).

L. INTERMEDIA Leggett, var. TYPICA: FIG. 4, fruit from West Roxbury, Massachusetts, October 9, 1885, *E. Faxon;* FIG. 5, seeds from same collection; FIG. 6, tip of basal shoot from same collection.

L. INTERMEDIA, var. JUNIPERINA (Bicknell) Robinson: FIG. 7, fruit from York Harbor, Maine, August 23, 1894, *Bicknell* (TYPE); FIG. 8, tip of basal shoot from Stonington, Deer Island, Maine, *Hodgdon*, no. 695.

L. INTERMEDIA, var. LAURENTIANA, n. var.: FIG. 9, fruit from vicinity of Longueuil, Quebec, *Victorin*, no. 8319 (TYPE); FIGS. 10 and 11, portions of basal shoots from the TYPE.

L. INTERMEDIA, var. DEPAUPERATA, n. var.: FIGS. 12 and 13, entire plants, × 2/5, from near Archibald River, south shore of Lake Athabaska, Saskatchewan, *Raup*, no. 6745 (TYPE).

UNIVERSITY OF NEW HAMPSHIRE,
Durham, New Hampshire

VALIDATION OF COMBINATIONS IN PALMER AND STEYERMARK'S ANNOTATED CATALOGUE OF THE FLOWERING PLANTS OF MISSOURI

JULIAN A. STEYERMARK

IN the August number of RHODORA, vol. 39, pages 309–10, 1937, Dr. Fernald questioned the validity of publication of most of the new combinations in Palmer and Steyermark's Annotated Catalogue of the Flowering Plants of Missouri.[1] In order that the validity of these names may not be open to question in the future, those which were published without complete bibliographical data are given below.

COMMELINA ERECTA L. var. **crispa** (Wooton) Palmer & Steyermark, comb. nov. *C. crispa* Wooton, Bull. Torr. Bot. Club **25**: 451. 1898.

STENANTHIUM GRAMINEUM (Ker.) Kunth f. **robustum** (Wats.) Palmer & Steyermark, comb. nov. *S. robustum* Wats. in Proc. Am. Acad. **14**: 278. 1879.

CAMASSIA **hyacinthina** (Raf.) Palmer & Steyermark, comb. nov. *Lemotris hyacinthina* Raf. Fl. Tell. **3**: 51. 1836.

[1] Ann. Mo. Bot. Gard. **22**: no. 3. 1935.

Quercus alba f. **latiloba** (Sarg.) Palmer & Steyermark, comb. nov. *Q. alba* var. *latiloba* Sarg., Bot. Gaz. **65**: 435. 1918.

Q. falcata f. **triloba** (Michx.) Palmer & Steyermark, comb. nov. *Q. triloba* Michx., Hist. Chênes Am. t. 26. 1801.

Q. falcata var. **leucophylla** (Ashe) Palmer & Steyermark, comb. nov. *Q. rubra* var. *leucophylla* Ashe, Bull. Charleston Mus. **13**: 25. 1917.

Claytonia virginica L. f. **robusta** (Somes) Palmer & Steyermark, comb. nov. *C. multicaulis* var. *robusta* Somes, Iowa Nat. **2**: 68. 1910. *C. robusta* (Somes) Rydb., Brittonia **1**: 87. 1931.

Clematis virginiana var. **missouriensis** (Rydb.) Palmer & Steyermark, comb. nov. *C. missouriensis* Rydb., Britton, Man. 421. 1901.

Delphinium azureum var. **Nortonianum** (Mack. & Bush) Palmer & Steyermark, comb. nov. *D. Nortonianum* Mack. & Bush, Trans. Acad. Sci. St. Louis **12**: 82, pl. 13. 1902.

Roripa **aquatica** (Eat.) Palmer & Steyermark, comb. nov. *Cochlearia aquatica* Eaton, Man. Bot. ed. 5. 181. 1829, not *C. aquatica* C. A. Mey. in Lebed. Fl. Alt. **3**: 88. 1831. *Neobeckia aquatica* (Eat.) Greene, Pittonia **3**: 95. 1896. *Radicula aquatica* (Eat.) Robinson, Rhodora **10**: 32. 1908.

Crataegus crus-galli f. **truncata** (Sarg.) Palmer, comb. nov. *C. truncata* Sarg., Rept. Mo. Bot. Gard. **19**: 57. 1908.

C. crus-galli var. **macra** (Beadle) Palmer, comb. nov. *C. macra* Beadle, Biltmore Bot. Studies **1**: 134. 1902.

C. crus-galli var. **Barrettiana** (Sarg.) Palmer, comb. nov. *C. Barrettiana* Sarg., Rep. Mo. Bot. Gard. **19**: 50. 1908.

C. crus-galli var. **leptophylla** (Sarg.) Palmer, comb. nov. *C. leptophylla* Sarg., Rep. Mo. Bot. Gard. **19**: 69. 1908.

C. crus-galli var. **pachyphylla** (Sarg.) Palmer, comb. nov. *C. pachyphylla* Sarg., Rep. Mo. Bot. Gard. **19**: 54. 1908.

C. crus-galli var. **bellica** (Sarg.) Palmer, comb. nov. *C. bellica* Sarg., Trees & Shrubs **2**: 236. 1913.

C. regalis var. **paradoxa** (Sarg.) Palmer, comb. nov. *C. paradoxa* Sarg., Rep Mo. Bot. Gard. **22**: 68. 1912.

C. pyracanthoides Beadle var. **arborea** (Beadle) Palmer, comb. nov. *C. arborea* Beadle, Biltmore Bot. Studies **1**: 137. 1902.

C. collina var. **succinta** (Sarg.) Palmer, comb. nov. *C. succinta* Sarg., Rep. Mo. Bot. Gard. **19**: 78. 1908.

C. collina var. **secta** (Sarg.) Palmer, comb. nov. *C. secta* Sarg., Rep. Mo. Bot. Gard. **19**: 83. 1908.

C. collina var. **sordida** (Sarg.) Palmer, comb. nov. *C. sordida* Sarg., Bot. Gaz. **33**: 114. 1902.

C. viridis var. **ovata** (Sarg.) Palmer, comb. nov. *C. ovata* Sarg., Man. Trees N. A. 402, f. 321. 1905.

C. viridis var. **lanceolata** (Sarg.) Palmer, comb. nov. *C. lanceolata* Sarg., Trees & Shrubs **2**: 65, pl. 130. 1908.

C. VIRIDIS var. **lutensis** (Sarg.) Palmer, comb. nov. *C. lutensis* Sarg., Rep. Mo. Bot. Gard. **22**: 75. 1912.

C. VIRIDIS var. **atrorubens** (Ashe) Palmer, comb. nov. *C. atrorubens* Ashe, Journ. Elisha Mitchell Sci. Soc. **16**: 78. 1900.

C. PRUINOSA f. **angulata** (Sarg.) Palmer, comb. nov. *C. angulata* Sarg., Proc. Acad. Phil. **62**: 166. 1910.

C. PRUINOSA var. **brachypoda** (Sarg.) Palmer, comb. nov. *C. brachypoda* Sarg., Rep. Mo. Bot. Gard. **19**: 100. 1908.

C. DISJUNCTA var. **magnifolia** (Sarg.) Palmer, comb. nov. *C. magnifolia* Sarg., Trees & Shrubs **2**: 69, pl. 132. 1908.

C. MACKENZII var. **bracteata** (Sarg.) Palmer, comb. nov. *C. bracteata* Sarg., Rep. Mo. Bot. Gard. **19**: 91. 1908.

C. MOLLIS f. **dumetosa** (Sarg.) Palmer, comb. nov. *C. dumetosa* Sarg., Rep. Mo. Bot. Gard. **19**: 109. 1908.

C. CALPODENDRON var. **obesa** (Ashe) Palmer, comb. nov. *C. obesa* Ashe, Journ. Elisha Mitchell Sci. Soc. **20**: 47. 1904.

C. CALPODENDRON var. **hispidula** (Sarg.) Palmer, comb. nov. *C. hispidula* Sarg., Rep. Mo. Bot. Gard. **19**: 116. 1908.

C. SUCCULENTA var. **pertomentosa** (Ashe) Palmer, comb. nov. *C. pertomentosa* Ashe, Journ. Elisha Mitchell Sci. Soc. **16**: 70. 1900.

ROSA CAROLINA var. **Lyonii** (Pursh) Palmer & Steyermark, comb. nov. *R. Lyonii* Pursh, Fl. Am. Sept. **1**: 345. 1814.

R. PALUSTRIS var. **dasistema** (Raf.) Palmer & Steyermark. *R. dasistema* Raf., Ann. Gen. Sc. Phys. **5**: 219. 1820.

RHUS CANADENSIS var. **serotina** (Greene) Palmer & Steymark, comb. nov. *Schmaltzia serotina* Greene, Leaflets, Bot. Obs. & Crit. **1**: 131. 1905.

ACER SACCHARUM f. **Rugelii** (Pax) Palmer & Steyermark, comb. nov. *A. Rugelii* Pax, Engl. Bot. Jahrb. **7**: 243. 1886.

CORNUS FLORIDA f. **rubra** (Weston) Palmer & Steyermark, comb. nov. *C. florida* var. *rubra* Weston, Bot. Univ. **1**: 73. 1770. *C. florida* var. *rubra* André, Rev. Hort. **66**: 500. 1894.

ASCLEPIAS SYRIACA L. var. **kansana** (Vail) Palmer & Steyermark, comb. nov. *A. kansana* Vail, Bull. Torr. Bot. Club **31**: 457; pl. 16, fig. 4; pl. 18. 1904.

TRIOSTEUM AURANTIACUM Bicknell var. **illinoense** (Wieg.) Palmer & Steyermark, comb. nov. *T. perfoliatum* var. *illinoense* Wiegand, RHODORA **25**: 199–203. 1923. *Triosteum illinoense* (Wiegand) Rydb, Brittonia **1**: 96. 1931.

SOLIDAGO ARGUTA var. **Boottii** (Hook.) Palmer & Steyermark, comb. nov. *S. Boottii* Hook. Comp. Bot. Mag. **1**: 97. 1835.

S. GLABERRIMA var. **moritura** (Steele) Palmer & Steyermark, comb. nov. *Solidago moritura* Steele, Contrib. U. S. Nat. Herb. **13**: 370. 1911.

S. NEMORALIS var. **longipetiolata** (Mack. & Bush) Palmer & Steyermark, comb. nov. *S. longipetiolata* Mack. & Bush, Trans. Acad. Sci. St. Louis **12**: 87. pl. 16. 1902.

HELIANTHUS HIRSUTUS var. **leoninus** (E. E. Wats.) Palmer &

Steyermark, comb. nov. *H. leoninus* E. E. Wats. Papers Mich. Acad. Sci. **9**: 449, pl. 75. 1929.

Artemisia campestris L. var. **caudata** (Michx.) Palmer & Steyermark, comb. nov. *A. caudata* Michx. Fl. Bor. Am. **2**: 129. 1803. *A. campestris* subsp. *caudata* (Michx.) Hall & Clements, Phylog. Meth. Taxon. 122. 1923.

Artemisia vulgaris var. **Wrightii** (Gray) Palmer & Steyermark, comb. nov. *A. Wrightii* Gray, Proc. Am. Acad. **19**: 48. 1883. *A. vulgaris* subsp. *Wrightii* (Gray) Hall & Clements, Phylog. Meth. Taxon. 80, pl. 9. 1923.

Field Museum of Natural History,
Chicago, Illinois.

RARE PLANTS IN MICHIGAN

O. A. Farwell

On August 10, 1937, accompanied by Mr. Thomas Taper, a local botanist, I made a trip to investigate a peat bog I had heard about. It is 5 miles northwest of Lake Linden and a little over a mile northwest of Calumet. Elevation is 1,220 feet, about 600 higher than Lake Linden. All places mentioned are in the northern part of Houghton Co. Although we did not find the peat bog on this trip we did find an immense cat-tail bog ½ mile long by half as broad. This cat-tail bog is really a shallow lake which has been completely filled in with the plant. On the south side of this lake or bog there is perhaps an eighth of a mile of upland between it and a swampy piece of lowland. Along the border of the lowland swamp and extending up the side of the hill, northerly, we found a large field of some unfamiliar bunch grass which turned out to be Nardus stricta Linn. The basal leaves are up to a foot and a half long, erect-spreading, thus forming a circular stool or cockade a foot to a foot and a half in diameter and up to a foot or more high. The culms were ascending or horizontal. It covered a stretch of perhaps 200 yards by 50, very dense in places and scattered in others. There are probably around 500 stools or bunches. No. 11691.

On the upland between the *Nardus* and the cat-tail bog we found typical Prunella vulgaris L. (No. 11689) and its var. albiflora (Bogenhard) Farwell (No. 11688). The white-flowered variety is much more plentiful than the blue-flowered type. Mr. Fernald (Rhodora, Vol. 15, No. 178, Oct. 1913, p. 183) reports that he had seen it only

from Brookline, Mass. This locality is far removed from Massachusetts. Britton and Brown report the *Nardus* from Newfoundland and Amherst, Mass. Hitchcock leaves out Amherst but adds Waterville, N. H. and Fulton Co., N. Y. How it happened to get into this far-distant region is quite problematical.

On September 28 we made another trip to Calumet to find the bog mentioned at the beginning of this article and were successful in locating it. It branches out from the middle of the western side of the cat-tail bog in a southwesterly direction and is much less extensive. It is of the usual peat-bog type with heaths and sedges. At this time of the year it was dry. These bogs are of very recent origin and under 40 years of age since they were parts of one large, irregular lake and are so shown on government maps of the surveys of 1898–9.

Potentilla Hippeana Lehm. On our way home, we found a peculiar *Potentilla*, with much the habit of *P. argentea* but evidently not that species. Fragments were collected and sent to Mr. Fernald, to whom our thanks are here recorded for his kindness in identifying it. Its discovery at this locality, locally known as the Whiting Shaft Location, extends the range of this species far eastward and this is, I believe, the first record of its occurrence in Michigan. Roadsides, Whiting Shaft Location, near Calumet, No. 11713, Sept. 28, 1937.

Lake Linden, Michigan

Euphorbia dentata and Salsola collina in Minnesota.—While investigating an old orchard-site, September 3, 1937, immediately west of the Chicago, Rock Island and Pacific Railroad right of way, one mile south of Inver Grove, Dakota County, Minnesota, a patch of a strict *Euphorbia* was encountered. This proves to be *Euphorbia dentata* Michx. Perusal of published records of plants from Minnesota and a lack of any specimens from Minnesota in our herbarium indicate that this is a new record for the state. Whether this species is native or introduced at this station is open to question.

On September 12, 1937, while again collecting plants in Dakota County, a very striking *Salsola* was noticed on a new sandy road-grade to South Park, a short distance west of the new pumping station of the city of South St. Paul. The virgate habit, the appressed leaves on the branchlets, the wingless perianth-segments, and the nut-like enclosures of the fruits toward the base of the plants all pointed to a

species very different from any reported in American manuals. This species is *Salsola collina* Pall. Ledebour in his Flora Rossica, vol. 3, pt. 2, 1849–1851, p. 800, notes the occurrence of *S. collina* as follows: "Hab. in R o s s i a a u s t r a l i [in deserto caspio ad lac. sals. Elton (Pall.), inter fl. Samara et Ural (Claus)] inque S i b i r i a a l t a i c a! (Fl. Alt.) in des. soongoro-kirghisico! (Fl. Alt., Karel. et Kiril.) et b a i k a l e n s i! (Turcz.). ☉." In Engler's Die Natürlichen Pflanzenfamilien, ed. 2, vol. 16c, p. 564, 1934, it is said to be "selten in Mitteleuropa adventiv."

The presence of *Salsola collina* in Minnesota indicates that another Asiatic species is being added to the adventive flora of the United States.

A duplicate specimen of each has been deposited at the Gray Herbarium: no. 10,146, *Euphorbia dentata* Michx.; no. 10,151, *Salsola collina* Pall.—John W. Moore, Herbarium, Department of Botany, University of Minnesota.

Three Transfers.—In the course of routine work it has been found necessary to make the following transfers:

Aquilegia formosa Fisch. var. **caelifax** (Payson), comb. nov. *A. formosa* ssp. *caelifax* Payson in Contrib. U. S. Nat. Herb. xx. 144, pl. 9 (1918).

Potentilla **Jaegeri** (Munz & Johnston), comb. nov. *Ivesia Jaegeri* Munz & Johnston in Bull. Torr. Bot. Club, lvi. 165 (1929).

Astragalus **mancus** (Rydb.), comb. nov. *Hamosa manca* Rydb. in Bull. Torr. Bot. Club, liv. 17 (1927).—Louis C. Wheeler, Gray Herbarium.

Volume 40, no. 469, including pages 29–76 and plate 488, was issued 5 February, 1938.

APR 18 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. April, 1938. No. 472.

CONTENTS:

Postglacial History of Vegetation in Northwestern Wisconsin. *L. R. Wilson* 137

Notes on the Lobelias in the Herbarium of Stephen Elliott. *Rogers McVaugh* 175

New Combinations and undescribed Forms from Missouri. *Julian A. Steyermark* 177

A Flora of Oklahoma (Review). *M. L. F.* 179

New Selenia from Texas. *Robert F. Martin* 183

Datura Stramonium, var. inermis. *M. L. Fernald* 184

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **April, 1938.** **No. 472.**

THE POSTGLACIAL HISTORY OF VEGETATION IN NORTHWESTERN WISCONSIN

L. R. Wilson

Introduction

The Quaternary history of vegetation in the United States has been studied from many angles and the general features are agreed upon by botanists. These investigations have been, in the past, confined largely to macroscopic studies of fossil plants and to a study of the present distribution of floral elements. Within the last decade, attention has been drawn to the value of microscopic examination of peat deposits as an aid to the unravelling of the many problems of Pleistocene and post-Pleistocene plant distribution. These studies have been widely made in Europe and also to a lesser degree in America. The results in Europe have been definite enough to convince the ecologist that this method is one of value in determining the succession of plants in a region.

The present study was begun in the summer of 1929, in Douglas County in the northwest corner of Wisconsin. This county was chosen for the following reasons: (1) It has a post-glacial history that can be divided into definite periods, during which plants could have lived. These periods were associated with the controversial northern end of Glacial Lake Grantsburg, glacial lakes Duluth, Algonquin, and the Nipissing Great Lakes. (2) These lakes, except for the Nipissing Great Lakes, covered more of Douglas County than does the present Lake Superior and it has been possible to secure peat materials associated with each of these lakes. (3) There is considerable geological and botanical literature at hand dealing with the basic problems of geology and botany in Douglas County.

During the investigation an attempt was made to trace or determine in Douglas County (1) the vegetational succession from the earliest post-glacial time to the present, (2) the date of appearance of certain plant species by a comparison of peat deposits associated with the various lakes, and (3) to compare the fossil spectra and the present ecological succession on the various soils of Douglas County.

Methods: The methods used in this study were essentially the same as used by others engaged in like investigations. The collection of materials for study was accomplished by the use of a Davis Peat Sampler, a Hiller Peat Sampler, or by digging and carefully cutting samples of peat out of the walls of the test pits. The three methods of securing peat, when checked against one another, gave the same results. The first method was found to be the most rapid and the last the most reliable.

The bogs or peat deposits chosen for study were usually less than one acre in area. The reason for this choice becomes significant when one examines the conditions where peat is now accumulating in water. Bog lakes at the present time that are larger than one or two acres in area often present complicated problems of sedimentation, which are likely to confuse and destroy the regular deposition of the finely divided sediments. These conditions are minimized by working smaller peat deposits and the results have been found to be very satisfactory. It is also usually possible to dig into the smaller deposits and to examine in greater detail the materials of the lowest horizons.

Peat samples were secured from two, three, or four borings or test pits in the deepest part of each bog. Samples of peat were taken at various depths and the intervals were determined largely by the depth of the deposit. The lowest samples were taken about one inch below the contact of peat and the mineral soil. These usually did not contain fossils. Samples were always taken at the contact of the peat and mineral soil, and contained fossils. Other samples were collected at intervals varying in distance from one-half inch up to ten inches apart. The highest sample was taken from the surface of the bog. In this country it has not been the general practice of investigators to examine peat from the surface of the bog. This is unfortunate, for the one possible means of comparing the living flora and the relative abundance of pollen on the bog's surface with the fossils throughout the profile is neglected. Draper ('29) states, "It should be noted that counts from the upper level of any bog are of questionable value be-

cause of the chance of oxidation by drainage or by burning." The present study has shown that the upper levels in a bog are reliable indicators of the flora under normal conditions.

The peat specimens were preserved in vials containing a solution of 30% alcohol. This method of storing the peat was found to be more satisfactory than drying. Peat preserved in alcohol is easily studied and the microfossils appear to suffer less destruction in their subsequent preparation than when the peat has been previously dried.

The following schedule was used in preparing the samples for microscopic examination. Approximately 16.4 cc (one cubic inch) of moist peat was thoroughly broken up in 500 cc of distilled water and boiled for three minutes. The mixture was allowed to cool and 10 cc. of normal solution of sodium hydroxide was added to it and then thoroughly stirred. When the peat was of a fibrous or gritty nature it was passed through a one millimeter mesh screen and the residue washed several times with the filtrate. At this point enough saffrin stain was added to slightly color the fossils. This was determined by test slides. The filtrate was then centrifuged and the collected material transferred to 40 cc of glycerine jelly and dehydrated in a desiccator. Next the mixture was melted by placing the container in hot water. The sample was again thoroughly stirred, and with a glass rod, enough solution was placed on each of five labelled microscopic slides to float a number one cover glass. Each slide, as it received its cover glass, was quickly turned over and placed horizontally in a rack to cool.

Examination of the slides was done under a microscope using a 10× ocular and a 16 mm. objective. The slide was controlled with a mechanical stage and artificial light was used entirely for illumination. Two hundred fossils were counted for each horizon. Usually fifty fossils from each of four slides were counted and added to the total to bring the count up to two hundred.

The most satisfactory method of recording the species and abundance of microfossils was found to be with a typewriter. This was set up at the side of the microscope and adjusted to record only fifty letters or figures in a row. A convenient code was established with certain letters or figures representing certain fossils. With this method of recording the slides of one level can be listed and totaled all on one page and can constitute a permanent record for the files. Ordinarily, much eye strain is encountered while making records in

writing, but that is reduced to a minimum with the use of a recorder such as a typewriter.

Unknown fossils have been drawn with the camera lucida and preserved for reference and study. Their positions on the slides have been encircled with a china-marking pencil to facilitate easy reference.

In the identification of the microfossils constant reference was made to pollens, spores, and trichomes of recently collected plants whose parts had been treated with sodium hydroxide and stained in a manner similar to the peat fossils. Measurements were made with an ocular measuring disk.

In the tables showing percentages of microfossils in 10 bogs of Douglas County, Wisconsin, the depths in inches are given in italics at the tops of the columns.

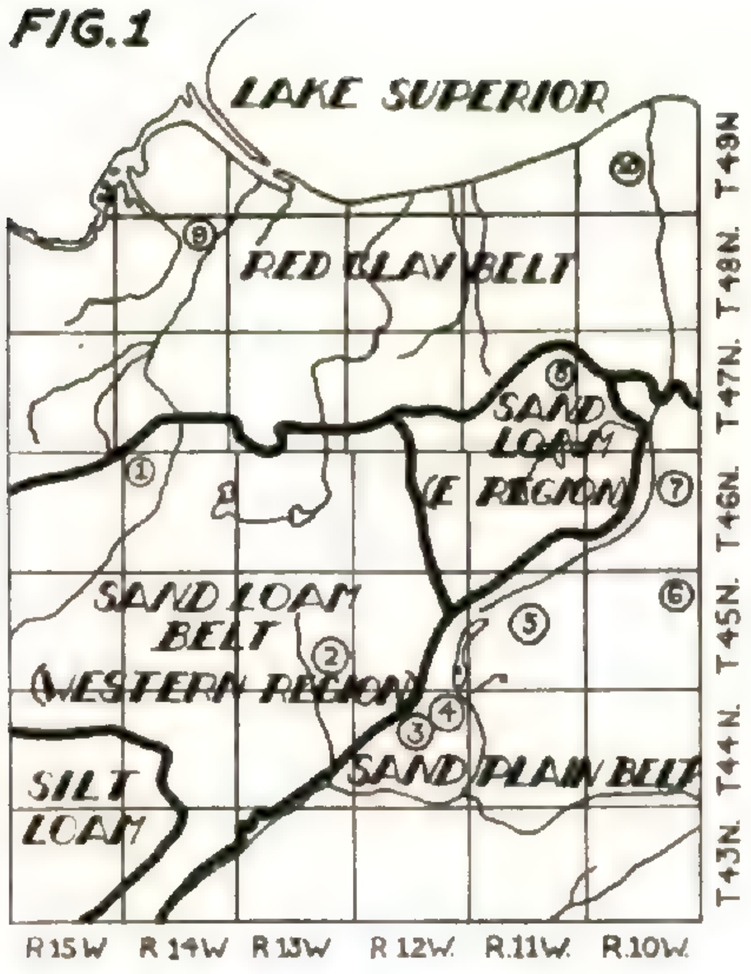
Geology

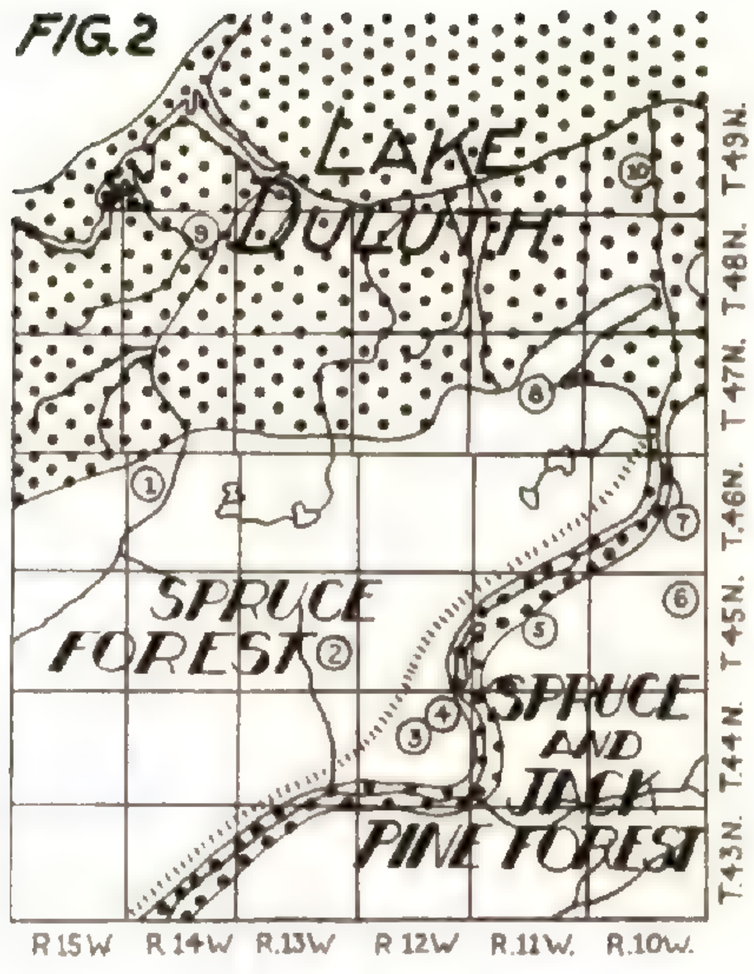
Douglas County comprises approximately 1500 square miles in the northwestern corner of Wisconsin. It lies at the west end of Lake Superior and part of the county is within the lowland adjoining the lake. The topography is of two distinct kinds and upon this basis the county is divided into two geographical provinces, the Lake Superior Lowland, and the Lake Superior Upland. The division of these is given by Martin (p. 431, '32) as the highest abandoned beach line on the south shore of Lake Superior (Fig. 2). The lowland is essentially a plain, sloping gently toward the lake, and trenched by streams to a depth of 25 to 100 feet. The upland is rolling and rugged with morainic features, pitted outwash plains, and large areas of poorly drained topography on which swamps and bogs have developed. The existence of these geographical provinces is due to the presence of a graben at the west end of Lake Superior, which depressed the Upper Keweenawan sandstones below the level of adjacent trap rocks (Martin, p. 429, l. c.). This is supposedly of Pre-Cambrian age and was subsequently filled with sediments and then excavated by water and ice erosion into its present general condition. The soils of the lowland are largely clay and silt with a distinctively red color. The origin of these is lacustrine and they were deposited in the glacial lakes which formed upon the retreat of the ice sheets. The soils of the upland are heterogenous. In the areas of moraines they are rocky and contain a mixture of sand, silt, and clay. In the areas of outwash they are sandy (see soil map, Fig. 1).

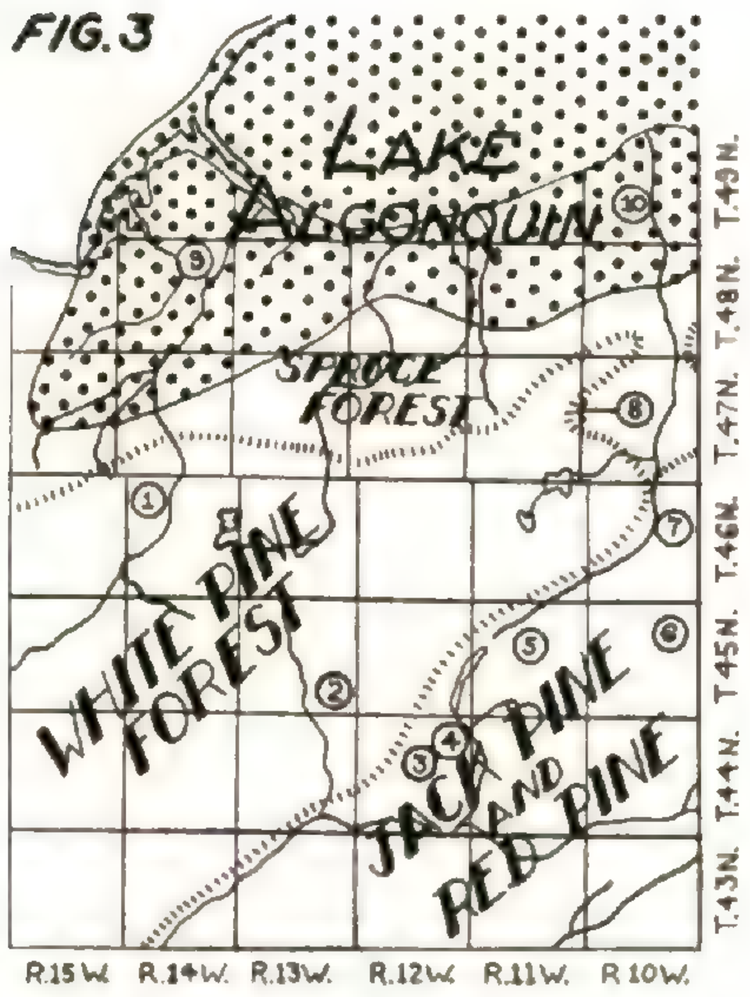
The complete Pleistocene history of Douglas County is not yet clearly understood and entirely agreed upon by geologists; however, it is possible to give a general outline of the events, at least during the latter part. Although drift earlier than the Third Wisconsin or Cary Substage is not known in Douglas County, it seems reasonable to conclude that the region was traversed by ice during most of the glacial stages. Leverett (Fig. 5, p. 19, '28) has mapped the drift in the southern part of the county as Third Wisconsin Substage (Cary) and that in the central and northern part as Fourth Wisconsin Substage (Mankato). Upon further investigation these drifts may prove to be the Fourth and Fifth Substages respectively.

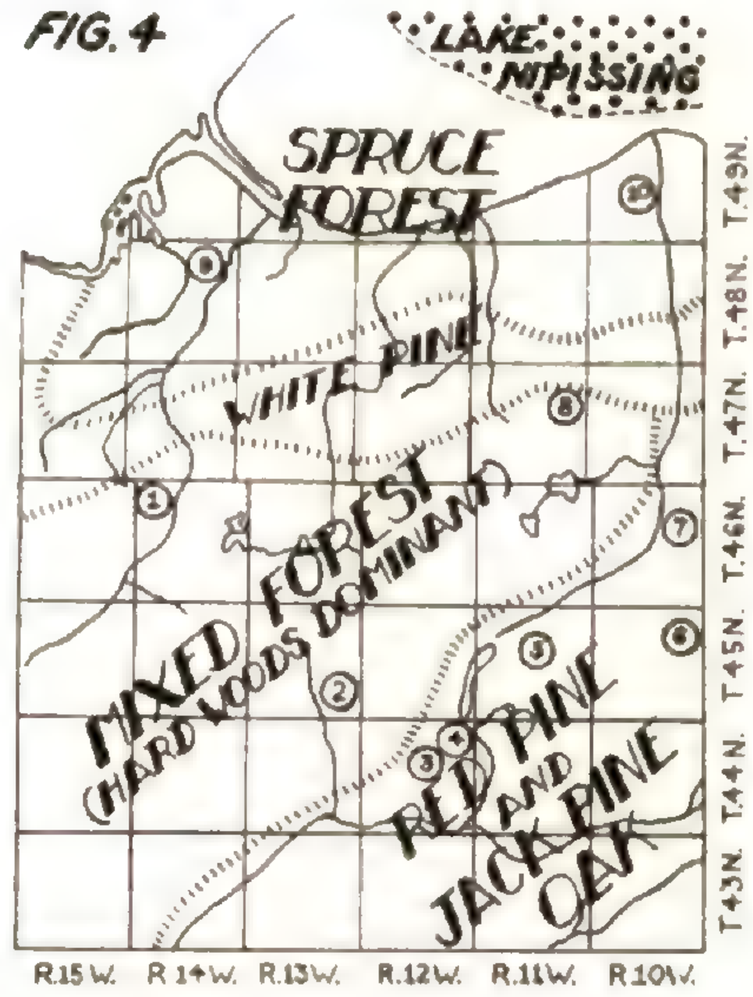
After the last Cary Ice had melted back there was evidently a period during which glacial lakes formed along the margins of the retreating ice front. Of these in northern Wisconsin, Martin (pp. 453–454, '32) makes reference to a so-called "Glacial Lake Rouge" and to a "Glacial Lake Sioux" farther east in the Lake Michigan basin. These two lakes are better known as Early Lake Duluth and a stage of Early Lake Chicago respectively. The first formed in the same basin occupied later by Glacial Lake Duluth and according to Martin probably drained by the same outlet. With the continued retreat of the ice this lake and another, Glacial Lake Milwaukee (Early Lake Chicago), in the Lake Michigan Basin coalesced and formed what he calls "Glacial Lake Sioux." Following the formation of "Glacial Lake Sioux" there was another advance of the Wisconsin Ice Sheet (Mankato), with one lobe entering the state and Douglas County from the north while another lobe entered Wisconsin southwest of Douglas County, from the northwest. Martin further states that, "The interval between the termination of Glacial Lake Sioux and the readvance was sufficiently long for the growth of forests." He refers to the forest bed at Two Creeks, Manitowoc County, Wisconsin, and those in the Fox River Valley for this proof (Martin p. 268, l. c.).

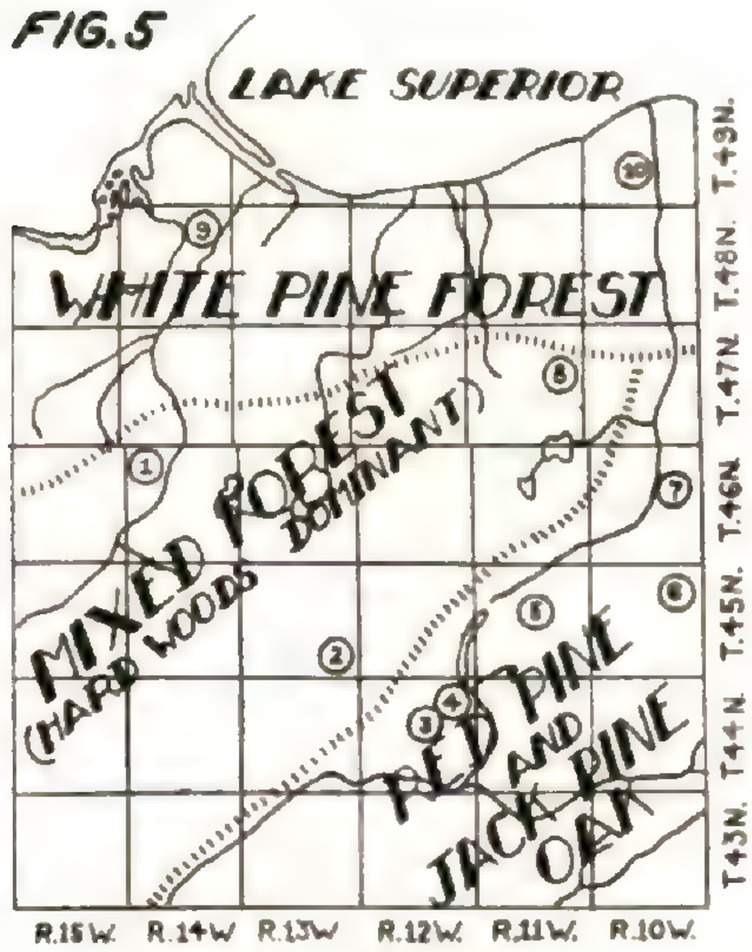
That there was an interval between the two Wisconsin substages in Douglas County during which glacial lakes existed and forests flourished is strongly suggested by two fossil logs collected near Solon Springs on the west shore of Lake St. Croix in Government Lot No. 4, Section 18, Township 45 North, Range 11 West. These logs were buried beneath eight feet of river gravel of which the lower part resembles a hard-pan formation. They were discovered by Mr. George Schunning of Superior, Wisconsin, while drilling a well, but











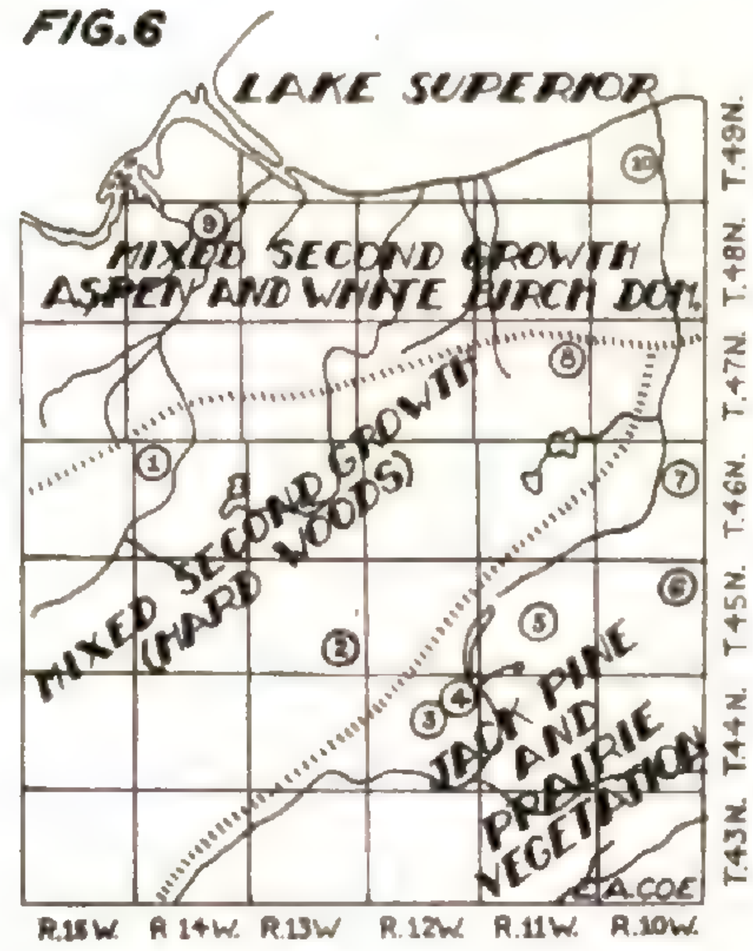


FIG. 1, Soil-belts of Douglas County, Wisconsin, and Locations of investigated Peat-deposits; 2, Forests of Douglas County at time of Glacial Lake Duluth; 3, Forests of Douglas County at time of Glacial Lake Algonquin; 4, Forests of Douglas County at time of Nipissing Great Lakes; 5, Forests of Douglas County in 1897, prior to extensive Lumbering Operations; 6, Forests of Douglas County at present time.

were not disturbed until examined by the writer. The gravels were deposited in the outlet river of Glacial Lake Duluth or possibly of the so-called "Glacial Lake Rouge" discussed by Martin. The two logs were parallel with one another and pointing in the general direction of the glacial river channel. The gravel overlying their resting place is very coarse and well washed. The hard-pan is of the same coarse material, but also has considerable sand mixed with it and the whole mass is cemented together with a ferruginous matrix. In digging out the logs it was necessary to dig about two feet below them. At that depth, masses of red clay typical of the Superior Lowland were encountered.

The logs were studied microscopically and found to be a species of spruce, possibly *Picea glauca* (Moench) Voss. They are in an excellent state of preservation and the growth-rings are easily counted. The larger log is six inches in diameter and has fifty-five growth-rings present, while the smaller log is approximately five inches in diameter and has forty-six growth-rings. These rings are of the same size as appear in logs of *P. glauca* today and they also show a reduction in width near the surface such as was observed in the logs of the Two Creeks Forest Bed (Wilson, '32).

During the maximum extension of the ice-lobe in the bed of Lake Superior and its gradual recession north of the Copper Range in Douglas County, there were glacial lakes present along its borders. These continued to grow in area and each survived long enough to allow the cutting of beaches.

While the Superior lobe was at its full extent there existed along the margin of the ice at the west end of the Lake Superior basin a glacial lake known as Glacial Lake St. Louis. It did not extend into Douglas County but occupied the central part of the St. Louis drainage basin in Minnesota. This lake drained down the present course of the St. Louis River to Scanlon, Minnesota, and from there southward to the Kettle River, thence to the St. Croix and Mississippi rivers.

As the ice front receded slightly there came into existence a small lake probably fifty square miles in area, in the upper part of the Nemadjii River basin. The well defined beaches and cuts made into morainic ridges indicate that this lake endured a considerable length of time.

On the eastern side of the county there appeared another small

lake as the ice receded. This is known as Glacial Lake Brule, and it developed in the northern end of the Brule River valley. It covered an area of approximately twenty square miles.

At about this time, or earlier, in the valley of the St. Croix River there was forming a glacial lake due to an ice advance from the Kewatin center. The ice-front advanced across the Mississippi River between St. Paul and Clearwater, Minnesota, and reached Grantsburg, Wisconsin. This appears to have dammed the Mississippi and St. Croix Rivers and resulted in the formation of Glacial Lake Grantsburg. The presence of clays within the region further shows the existence of a body of glacial water. The extent of Lake Grantsburg is not agreed upon by geologists. By some, it is thought to have extended well into Douglas County (Hansell, '30), but by others the area of the glacial lake is thought to have been restricted to narrower limits in Burnett and Polk Counties.

With further recession of the ice in the Superior basin the several marginal lakes along the south range joined and fell to the common level of Glacial Lake Brule. The drainage of these lakes was south through the Brule-St. Croix rivers. Upon the formation of this larger body of water, Glacial Lake Duluth came into existence.

The outlet of Glacial Lake Duluth was also by way of the Brule and St. Croix rivers. This lake appears to have lasted a considerable period and became very extensive. This is suggested by the deepened channel and terraces of the outlet. Another evidence for its long duration is the well defined beaches upon its shores. The extent of this lake over Douglas County is shown in Figure 2. The lake must have stood nearly 700 feet higher than the present level of Lake Superior, and according to Hansell (l. c.) there is evidence of an even higher level.

When the ice in the Lake Superior basin melted away from the sides of the Huron Mountains and from the western part of the Upper Peninsula of Michigan, Glacial Lake Duluth began to drain into the Lake Michigan basin. There was a drop in the water level and gradually there came into existence the extensive Glacial Lake Algonquin. In the Superior basin the water level then stood about 350 feet above the present level of Lake Superior and the Brule-St. Croix outlet ceased to function. In Douglas County a new strip of land was exposed by this fall of the water level (Fig. 3). The ice in the Great Lakes basin continued to recede in a northeast direction and in so

doing uncovered lower and lower outlets, which further lowered Glacial Lake Algonquin and brought into existence the Nipissing Great Lakes (Fig. 4). At the head of the Superior basin this shoreline is below the present one of Lake Superior. The Nipissing stage appears to have existed for a considerable period as is indicated by well marked beaches and extensive peat deposits submerged in Lake Superior. Martin (p. 463 l. c.) in discussing the duration of this lake states, "It seems possible that the present stage of Lake Superior has not yet existed as long as did the Nipissing Great Lakes." It is also true that the Nipissing beaches are broader and higher than those of lakes Duluth and Algonquin.

Lake Superior developed from the Nipissing Great Lakes largely as the result of the differential uplift of the region. This has resulted in the establishment of the St. Lawrence River outlet of the Great Lakes and, in Douglas County, the drowning of certain river valleys at the head of Lake Superior. Subsequent topographic modification in Douglas County has been restricted to the erosion of former lake and drift deposits by streams which flow across them and to the filling of small lakes with sedimentary materials forming swamps and boglands such as described above.

The Present Vegetation

The floral components of Douglas County are several but the most conspicuous is the Canadian. This flora in Douglas County is composed of such trees as *Pinus Banksiana, P. resinosa, P. Strobus, Picea glauca, P. mariana, Abies balsamea, Thuja occidentalis, Larix laricina, Betula papyrifera, B. lutea, Quercus borealis,* and *Acer saccharum.* It will be noted that the greatest number of these species are gymnosperms. The important shrubs of this flora are heaths and the following are the common species: *Andromeda glaucophylla, Gaylussacia baccata, Chamaedaphne calyculata, Vaccinium pennsylvanicum, Arctostaphylos Uva-ursi, Kalmia polifolia,* and *Ledum groenlandicum.* Other important shrubs are *Myrica Gale, M. asplenifolia, Betula pumila,* var. *glandulifera, Corylus americana, C. cornuta, Alnus crispa, A. incana, Acer spicatum, Dirca palustris,* several species of *Lonicera* and *Salix,* and numerous species in the complex genus *Rubus.* The species of the herbaceous flora are too numerous to list, but it contains in abundance such species as *Clintonia borealis, Coptis trifolia, Mitella nuda, Sarracenia purpurea, Chiogones hispidula* and *Moneses uniflora.*

The above species are present on the uplands or in the bogs and a number of them are important in the fossil records of Douglas County.

The second most important element in the flora of the county is the Alleghenian. To this belong such trees and shrubs as *Rhus typhina*, *Juglans cinerea*, *Ulmus americana*, *Tilia americana*, *Carpinus caroliniana*, *Prunus virginiana*, and several species of *Cornus*.

The third element is that of the Atlantic Coastal Plain. This according to McLaughlin ('32) is associated with the Glacial Great Lakes. The important species of this flora are *Xyris torta*, *Rynchospora capitellata*, *Eriocaulon septangulare*, *Vaccinium macrocarpon*, and *Echinochloa Walteri*.

The fourth member of the Douglas County flora is the prairie element. These are species that are all herbaceous and for the most part of technical taxonomic groups. They contain many grasses and composites as well as some legumes. In Douglas County this flora is confined to sandy soils.

The most recent floral member is the weed element that has invaded the region from Europe. These species are best developed upon cultivated or abandoned soil. *Ranunculus acris* and *Taraxacum officinale* especially have thrived, often to the extent of completely coloring the landscape.

The present vegetation is quite definitely divided into two belts, which to some extent closely follow the soils. The soil map of Douglas County (Fig. 1) shows several rather distinct regions, but the vegetation in these is generally distributed except in the *sand plain belt*. There is found at the edge of this belt a sharp transition and only species able to grow on light acid soils are to be found on the sand plain. This belt is locally known as the sand barrens, and the name quite graphically portrays the area. The vegetation upon the light sandy soils today is a remnant of a once extensive pine forest, and an invading prairie flora. Upon the *sand plain* many lakelets have developed into bog-land and upon these areas, in a few localities, are to be found bog-land associations of the same type as found in the other soil belts.

The *sandy loam*, *silt loam*, and *red clay* belts contain a more varied flora than the *sand plain*, and are more nearly alike in their components than one might expect. *Pinus Strobus*, *Acer saccharum*, and *Quercus borealis* were the dominant trees in the virgin forests. Over much of this area at the present time the two most important trees are *Populus tremuloides* and *Betula papyrifera*.

The condition of the forests in Douglas County near the end of the nineteenth century according to Roth ('98) and old residents was such that the northern one-third of the county (upon the red clay) was occupied almost wholly by *P. Strobus*, the middle one-third was a mixed hardwood and pine forest, and the southeastern part, except for that occupied by a silt loam in the extreme southeastern corner, was covered by *P. resinosa*, *P. Banksiana*, and *Quercus ellipsoidalis*.

Since that time the forests have been almost completely logged or burned over and today there remain only a few isolated areas of virgin timber. At the present time, according to Bordner and others (p. 18, '33), 79.5% of Douglas County is covered by forest land in various stages of development, 6.7% by bog and open swamp, 1.4% by water, and 1.9% by urban development.

Peat Deposits of Pro-Glacial Lake-Duluth-Age

It is stated above that Glacial Lake Duluth probably stood 700 feet above the present level of Lake Superior in Douglas County and drained by way of the Brule and St. Croix rivers. Therefore, the depressions located above this level should have come into existence with the recession of the ice sheet that controlled the elevation of the various glacial lakes in the Lake Superior Basin and they each must have developed independently from that early time. Those bogs numbered 1 and 2 in Fig. 2 are above the level of Glacial Lake Duluth and therefore represent the earliest depressions in which organic sediments could have collected. The existence of Lake Grantsburg in Douglas County is now generally discounted and the bogs numbered 3 to 6 inclusive are also of Pro-Lake-Duluth age.

It is impossible to state how soon after the formation of the depressions, in which each bog is located, organic sediments appeared, but there is evidence that indicates a very early date of deposition. Probably the best evidence is that found in bogs Nos. 3 and 4. These are formed in a pitted sand plain with ridges between them that indicates by the sharpness of the ridges that little subsequent modification has taken place in the topography since its formation. The bogs each cover an area of less than one acre and are surrounded on all sides by sand. In contrast to the sand walls the foundation of these bogs is blue clay, and downward, this gradually grades into Lake Superior red clay. Upon the blue clay no sand from the hillside was found, though a thorough search was made for it. Instead there is in both

bogs a sharp contact of clay and peat. It seems reasonable to expect that small bodies of water standing so favorably located for the drifting or washing of sand from the hillsides would soon have a layer of sand over their floors, and the absence of this is strong evidence that plant life appeared in the ponds almost immediately after they were formed. In addition to the above evidence, seeds and rhizomes of *Nymphozanthus* are present in the very lowest levels of the moss peat. This is highly suggestive that a phanerogam vegetation persisted in the region at the edge of the ice sheet. This genus is to a large degree water-dispersed, and in order to reach the bogs at such an early time, it must have been very near.

Bog No. 1.—Bog No. 1 is located on the west side of State Trunk Highway 35, approximately five miles south of Pattison State Park. It covers an area of several acres in Sections 7 and 18, Township 46 North, Range 14 West. Three borings were made in this bog, and the deepest was 120 inches. The mineral soils beneath the peat were found to be a mixture of sand and clay. The depression in which the bog is developed is a kettle hole in ground moraine.

Through most of the profile the peat is of the black woody type, but below 85 inches of the deepest boring a more decomposed type was found. This latter is of the kind usually found in deep water of the present northern bog lakes and is definitely of sedimentary origin.

The living plants of the surface of the bog are predominantly *Picea mariana*, *Ledum groenlandicum*, *Chamaedaphne calyculata*, and *Vaccinium spp.* These plants cover a loose mat of *Sphagnum* and *Polytrichum*.

The tree flora of the surrounding upland is largely *Pinus Strobus*, *Betula papyrifera*, and *Populus tremuloides*. The other trees present in lesser abundance are *Acer rubrum*, *Quercus ellipsoidalis*, *Abies balsamea*, and *Pinus resinosa*. The important shrubs are *Alnus incana* and *Salix sp.* The herbaceous vegetation contains such species as *Cornus canadensis*, *Epigaea repens*, *Gaultheria procumbens*, *Gramineae spp.*, and several species of *Aster* and *Solidago*. The upland vegetation as a whole is just recovering from the effects of lumbering and recent severe burning. No indication was found of recent fire on the bog.

This peat deposit appears to be well above the highest elevation reached by the waters of Glacial Lake Duluth during the cutting of its well marked beach (Fig. 2) and should, therefore, present a record of the flora from the time of recession of the Mankato ice.

PERCENTAGES OF MICROFOSSILS IN BOG NO. 1, DOUGLAS COUNTY, WISCONSIN

SPECIES	DEPTH IN INCHES												
	120	*115*	*105*	*95*	*85*	*75*	*65*	*55*	*45*	*35*	*25*	*15*	*0*
SPHAGNUM	0	0	1	1.5	.5	.5	0	3	9	3.5	7.5	9	12
POLYPODIACEAE	0	0	0	0	0	0	0	0	.5	0	0	0	0
LYCOPODIUM INUNDATUM	.5	.5	0	0	0	0	0	0	0	0	0	0	0
L. ANNOTINUM	0	0	0	0	0	0	.5	0	0	0	0	.5	1
L. CLAVATUM	0	.5	0	0	.5	0	.5	0	0	0	0	0	.5
L. OBSCURUM	0	0	0	0	0	0	0	0	0	0	0	0	1
PINUS STROBUS & P. RESINOSA	7	31	51.5	65.5	74	73	68	72.5	74.5	66.5	42	45.5	41
P. BANKSIANA	11	24	26	22.5	14.5	8.5	9.5	17.5	5.5	8.5	3	11.5	3.5
PICEA	72	32.5	7.5	2	4	6.5	4	3.5	4	9	21.5	22	16.5
LARIX	0	0	0	0	0	1	0	0	0	0	0	0	0
ABIES	0	1.5	2	0	0	.5	0	0	.5	1	2.5	.5	1
GRAMINEAE	3	2	3.5	0	1	0	0	0	0	0	0	0	0
SALIX	0	0	0	0	0	0	1.5	0	0	0	1	0	.5
BETULA	1.5	1	4	3.5	1	4	5	2	3	5.5	18.5	7.5	12
ALNUS	0	1	.5	.5	0	.5	1.5	.5	0	1	1	.5	.5
QUERCUS	1	2.5	0	0	1	.5	2.5	0	0	2.5	2	0	1
NYMPHAEACEAE	1	1.5	1	0	0	0	0	0	0	0	0	0	0
ACER	1.5	1	1	1.5	1.5	2.5	1.5	0	.5	1	0	1	.5
TILIA	0	0	0	0	0	0	0	0	.5	.5	0	0	0
ERICACEAE	0	.5	0	.5	0	0	0	0	0	0	0	1	7.5
CHAMAEDAPHNE	0	0	0	.5	0	0	0	0	0	.5	0	0	0
COMPOSITAE	1.5	.5	2	2	2	2.5	5.5	1	2	.5	1	1	1.5
BOG NO. 2	*41*	*38*	*36*	*31*	*26*	*18*	*14*	*9*	*6*	*4*	*0*		
SPHAGNUM	0	0	0	4	1	.5	20	7.5	.5	12	7		
LYCOPODIUM ANNOTINUM	0	0	0	0	0	0	0	0	0	0	.5		
L. CLAVATUM	0	0	0	0	0	0	0	.5	0	0	.5		
PINUS STROBUS & P. RESINOSA	5	6	16	6	12	15.5	12	10	19.5	15	32		
P. BANKSIANA	0	0	0	0	0	0	0	0	0	1	1		
PICEA	94	90	74	86	84	64	57	57	58.5	48	38		
ABIES	0	0	10	0	0	.5	1	3.5	1	4	2		

Bog No. 2 (Continued)	Depth in Inches										
	41	*38*	*36*	*31*	*26*	*18*	*14*	*9*	*6*	*4*	*0*
Gramineae	0	0	0	0	0	2	0	0	0	0	.5
Salix	0	0	0	0	.5	1	1	0	0	0	.5
Betula	0	2	0	2	.5	6	5	18	15	11	8
Alnus	0	0	0	0	.5	3	.5	1.5	1.5	1	1
Quercus	0	0	0	0	.5	2	1.5	1.5	2	2	1
Acer	0	2	0	0	.5	1	.5	0	0	1	0
Ostrya	0	0	0	0	0	.5	0	0	0	0	0
Ericaceae	0	0	0	0	0	0	0	0	1.5	1	2
Compositae	1	0	0	2	.5	4	1.5	.5	.5	4	6

Bog No. 3	*60*	*57*	*54*	*50*	*44*	*37*	*33*	*27*	*22*	*12*	*8*	*0*
Sphagnum	0	0	0	0	4	3	26.5	19	40	14	27.5	3.5
Lycopodium annotinum	0	0	0	0	0	0	0	0	.5	0	0	0
L. clavatum	0	0	0	0	.5	0	0	18	16	6.5	5	0
Pinus Strobus & P. resinosa	0	0	10	10	20.5	18	13.5	1.5	3	2	.5	23
P. Banksiana	22	10	30	16	3	3.5	6.5	39.5	34	39	59	27.5
Picea	74	86	56	64	64.5	64.5	30.5	0	0	1.5	2	30.5
Abies	2	4	2	3	1	0	.5	1	0	0	0	.5
Salix	0	0	2	3	.5	.5	2.5	14.5	0	29	3.5	.5
Betula	2	0	0	2	2	2	5	1	.5	.5	.5	5
Alnus	0	0	0	0	0	1	1.5	.5	0	2.5	0	.5
Quercus	0	0	0	0	.5	3	1.5	0	0	0	0	2
Tilia	0	0	0	0	0	0	0	.5	0	0	0	0
Ericaceae	0	0	0	0	5	2	10	3	4.5	2.5	2	1.5
Chamaedaphne	0	0	0	0	0	0	0	0	0	0	0	.5
Compositae	0	0	0	.2	1.5	2.5	2	1.5	1.5	2.5	0	5

Bog. No. 4	*81*	*72*	*63*	*54*	*45*	*36*	*27*	*18*	*9*	*4*	*0*
Sphagnum	6	2	1	2	13	14	51.5	13	11	19	13.5
Lycopodium annotinum	0	0	0	0	0	0	0	0	0	0	.5
L. clavatum	0	0	0	0	0	0	0	0	.5	0	0
Pinus Strobus & P. resinosa	0	14	37	44	55	33	10.5	25.5	30	20	23.5
P. Banksiana	24	56	4	38	10	9.5	7	4.5	6.5	6.5	9.5
Picea	70	28	48	11.5	15.5	22	24	50.5	45	45	42

Bog No. 4 (Continued)	Depth in Inches 81	72	63	54	45	36	27	18	9	4	0
Abies	0	0	0	0	0	0	0	1	0	.5	.5
Salix	0	0	1	0	.5	4	0	0	.5	0	1
Betula	0	0	5	1	2	1.5	0	3.5	5	4.5	5
Alnus	0	0	0	1	.5	.5	.5	0	0	.5	1
Quercus	0	0	4	0	1	2.5	.5	1	1	.5	1
Tilia	0	0	0	0	0	0	0	0	0	0	.5
Ericaceae	0	0	0	1	2	8.5	4.5	1	.5	3	.5
Compositae	0	0	0	1.5	.5	4.5	1.5	0	0	.5	1.5

Bog No. 5	85	75	65	55	45	35	25	15	5	0
Sphagnum	0	1.5	1	0	1	2	2.5	2.5	3	22
Polypodiaceae	0	0	0	0	0	0	.5	1	4	0
Lycopodium annotinum	0	0	0	0	0	0	0	0	1	0
L. clavatum	0	0	0	0	0	0	0	0	0	2
Pinus Strobus & P. resinosa	0	9.5	11	16	18.5	30	29	31	33	14
P. Banksiana	0	52.5	61	15	3.5	22	30	29	18	34
Picea	100	17.5	9.5	17.5	41	25.5	19	20	17	0
Abies	0	0	.5	3.5	10	.5	.5	1	2	0
Gramineae	0	9.5	9.5	45	23.5	9	10	0	0	0
Salix	0	1	0	.5	.5	0	1	2.5	1	0
Betula	0	4	2	0	.5	5	3.5	8	11	18
Alnus	0	0	2	0	.5	.5	1	2	2	0
Quercus	0	0	0	0	0	1	.5	.5	0	0
Acer	0	2	1	.5	0	1	0	0	0	0
Ericaceae	0	0	0	0	0	0	0	.5	3	0
Chamaedaphne	0	0	0	0	0	1.5	0	0	4	0
Compositae	0	2.5	2.5	2	1	2	2.5	2	1	10

Bog No. 6	135	125	115	105	95	75	65	55	45	35	25	15	5	0
Sphagnum	0	0	0	0	0	0	0	.5	0	0	.5	0	0	0
Polypodiaceae	0	0	0	0	0	0	0	0	0	0	0	.5	.5	0
Botrychium ternatum	0	0	0	0	0	0	0	0	0	0	.5	0	0	0
Lycopodium annotinum	0	0	0	0	0	0	0	0	0	0	.5	0	0	0
L. clavatum	0	0	0	0	0	0	0	0	0	.5	.5	0	0	0

	Depth in Inches													
Bog No. 6 (Continued)	*135*	*125*	*115*	*105*	*95*	*75*	*65*	*55*	*45*	*35*	*25*	*15*	*5*	*0*
Pinus Strobus & P. resinosa	7	36	50	48	51	46	46	47	50	47.5	42.5	44	51	30
P. Banksiana	36	56	26	38	32	37	40	39	25	28	20	30	29	42
Picea	57	6	18	10	10.5	12	3.5	7.5	14	14	28	20	12	12
Abies	0	0	0	2	0	1	0	0	1	0	.5	0	1	2
Typha	0	0	0	0	0	0	0	.5	0	0	0	0	0	0
Gramineae	0	0	0	0	3.5	0	6	0	0	0	0	0	0	0
Betula	0	2	4	0	2	2	1	.5	2.5	4	2.5	3.5	3	2
Alnus	0	0	0	0	0	.5	.5	0	0	1	0	0	.5	2
Quercus	0	0	2	0	0	.5	2	1	4	3	2	1	1	0
Acer	0	0	0	0	0	0	0	2	1	1	1	0	0	0
Compositae	0	0	0	2	1	1	1	2	2.5	1	1.5	1	2	10

Bog No. 7	*33*	*32*	*26*	*24*	*20*	*17*	*15*	*12*	*11*	*8*	*4*	*0*
Sphagnum	0	0	2	2	0	2	24	16	6	2	9.5	2
Polypodiaceae	0	0	0	10	0	0	0	0	4	0	0	.5
Lycopodium annotinum	0	0	0	0	0	2	0	0	0	0	0	0
L. clavatum	0	0	0	0	0	6	0	2	0	0	0	0
Pinus Strobus & P. resinosa	36	18	38	24	38	18	28	24	20	18	12.5	32
P. Banksiana	14	4	6	28	6	14	14	20	16	16	3	2.5
Picea	46	28	50	36	42	46	30	32	50	56	64	19
Larix	0	0	0	0	0	0	0	0	0	0	0	.5
Abies	0	2	2	0	0	8	0	6	0	2	1.5	2.5
Gramineae	0	0	0	0	0	0	0	0	0	0	0	1.5
Salix	0	0	0	0	0	0	2	0	0	0	1	1
Betula	2	2	0	0	10	0	0	0	2	4	2	1
Alnus	2	46	0	0	0	4	2	0	0	0	1	8.5
Quercus	0	0	0	0	2	0	0	0	0	0	1	1
Ericaceae	0	0	0	0	0	0	0	0	0	0	2	.5
Compositae	0	0	2	0	2	0	0	0	2	2	2.5	27.5

Bog No. 8	Depth in Inches														
	54	*53*	*50*	*47*	*43*	*39*	*36*	*33*	*28*	*22*	*16*	*11*	*7*	*3*	*0*
Sphagnum	0	0	0	0	.5	0	.5	1	0	0	3	12	6	6	3
Polypodiaceae	0	0	0	0	0	0	0	0	0	.5	0	0	0	0	1
Lycopodium lucidulum	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
L. annotinum	0	0	0	0	.5	0	0	0	0	0	0	0	0	0	0
L. clavatum	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
Selaginella selaginoides	0	0	0	2	4.5	14	0	0	0	0	0	0	0	0	0
Pinus Strobus & P. resinosa	0	0	0	0	5.5	11	20	21	29.5	18	18	7	12	24	19
P. Banksiana	0	0	0	0	0	0	8	11	23.5	5	4	4	8	10	11
Picea	100	100	100	98	84	67	62	50	27	24	57	55	46	32	11
Abies	0	0	0	0	3	3	3	12	16	8	7	4	8	9	4
Gramineae	0	0	0	0	2	4	2	2	0	6	4	11	7	4	25
Cyperaceae	0	0	0	0	0	0	0	.5	0	36	0	0	3	0	0
Salix	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0
Betula	0	0	0	0	0	0	1.5	1.5	1.5	0	4	4	3	13	5
Alnus	0	0	0	0	0	0	.5	0	1	0	1	0	3	0	3
Quercus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Acer	0	0	0	0	0	0	.5	.5	0	0	1	0	0	0	0
Ericaceae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Compositae	0	0	0	0	0	0	2	.5	1.5	1.5	0	2	1	1	16

Bog No. 2.—This bog is located on the north side of County Highway N, in Section 26, Township 45 North, Range 13 West.

It covers an area of approximately one quarter-acre and its maximum depth is forty-one inches. The mineral soil upon which the deposit has developed is a sandy blue clay and the soil of the surrounding area is a heavy sand-loam with many boulders dispersed through it. These soils constitute part of the Kerrick Morainic System mapped by Leverett (p. 23, '28). The basin in which Bog Number 2 has developed is a kettle hole in this moraine.

The peat below 31 inches appears to be of a truly limnic type while above that depth it contains wood and *Sphagnum* which indicates that the pond stage had been passed.

The plants on the bog at the present time are *Larix laricina* (dominant), *Picea mariana*, *Ledum groenlandicum*, *Chamaedaphne calyculata*, and several species of *Vaccinium* and *Carex*. The mat upon which these plants are growing is composed of *Sphagnum sp.* and *Polytrichum strictum*. The trees do not form a dense cover, for they are all approximately fifteen feet apart.

The upland flora is of the hardwood type with *Fraxinus pennsylvanica* var. *lanceolata*, *Ulmus americana*, and *Tilia americana* dominant. There also occur a few trees of *Pinus Strobus*, and *Picea glauca* in the area adjacent to the bog.

Like the previous deposit this one should also record the vegetation from its earliest appearance in the region.

Bog No. 3.—Bog No. 3 is approximately two miles south of the village of Solon Springs in Section 1, Township 44 North, Range 12 West.

The area of the deposit is slightly less than one acre. Six test pits were dug into it and a detailed cross-section of the deposit was studied. The deepest test pit was sixty inches to the contact with blue clay. Red lacustrine clay underlies the blue.

The whole deposit is developed in a saucer-like depression of lacustrine clay, the origin of which is not clear, but it appears to extend under the sand-hills that surround the bog. The depression is obviously a glacial kettle and the sand-hills which surround this and the other bogs of the vicinity are features of pitted outwash topography. The upland soil is a light cross-bedded sand with lenses of fine gravel interspersed.

In the deepest test pit there was found twenty-four inches of blue

clay overlying red clay of the same lithology. Overlying the blue clay in sharp contrast a thirteen inch layer of *Drepanocladus* and *Nymphozanthus* peat was found. This peat is composed of remarkably well preserved moss plants and rhizomes and seeds of *Nymphozanthus*. The sharp contact of the peat and clay, and lack of sand particles between the two, have been noted above as suggesting a very early colonization of the area by plant life. The mosses, when examined by Mr. L. S. Cheney, were found to be *Drepanocladus revolvens* and *D. Wilsoni*. These are aquatic forms which today have an Arctic and Canadian distribution.

Near the top of the brown moss peat there occurred a three inch layer of transitional material which contained fragments of *Drepanocladus* moss and finely divided limnic sediment. This peat type gave way above to a black and somewhat heterogeneous fibrous material. The upper stratum was 27 inches thick and in this material at a depth of 32 inches from the surface a thin charcoal layer was found. This indicates a burning of the bog surface, probably due to a forest fire in the region at a very early date in the post-glacial history of the region. The black fibrous peat is overlain by a loose mat of *Sphagnum* moss. It forms a cover that is nearly 17 inches thick over most of the bog. At the contact of the *Sphagnum* mat and the black peat, another charcoal layer was found. This layer is the result of fires that severely burned the bog cover and the surrounding upland in 1918.

The bog cover at the present time is almost entirely *Chamaedaphne calyculata* except near the edges where it is replaced to some extent by several species of *Carex*. Buried in the *Sphagnum* mat are to be found many stumps of *Picea mariana* which were burnt nearly to the level of their roots. Around the outer edge of the bog on the south side several species of *Salix* have become established and have formed a dense cover.

The upland flora has also suffered great destruction from the fire of 1918. There was previous to that time a moderate second-growth cover of *Pinus resinosa* and *P. Banksiana* but the forest fire which swept the area has not only almost completely destroyed this cover but also has burned off the upper humus layer of the soil.

Bog No. 4.—The location of this bog is a few hundred yards north of Bog Nunber 3, in Section 1, Township 44 North, Range 12 West.

The area of the bog is slightly more than one-fourth acre and the

greatest depth found was eighty-one inches. The formation of this deposit is identical with that of Bog No. 3. The basin soil is a blue lacustrine clay underlain by red clay of the same origin.

The peat was found to be in sharp contact with the blue clay and no sand was observed as occurring between the two deposits. The aquatic moss which makes up the lower peat stratum is *Calliergon trifarium* and is in the same perfect state of preservation as the mosses in Bog 3. This layer in the center of the bog was found to be eighteen inches thick and at the top to undergo a transition into a black limnic peat. The limnic peat also forms a layer which is nearly eighteen inches thick, and above that the peaty material is black and fibrous in nature. Much wood and moss tissues were found throughout.

The mat covering the bog is composed of several species of *Sphagnum* and of *Polytrichum strictum*. The plants occurring on this mat are *Chamaedaphne calyculata*, *Ledum groenlandicum*, and a few small trees of *Picea mariana*.

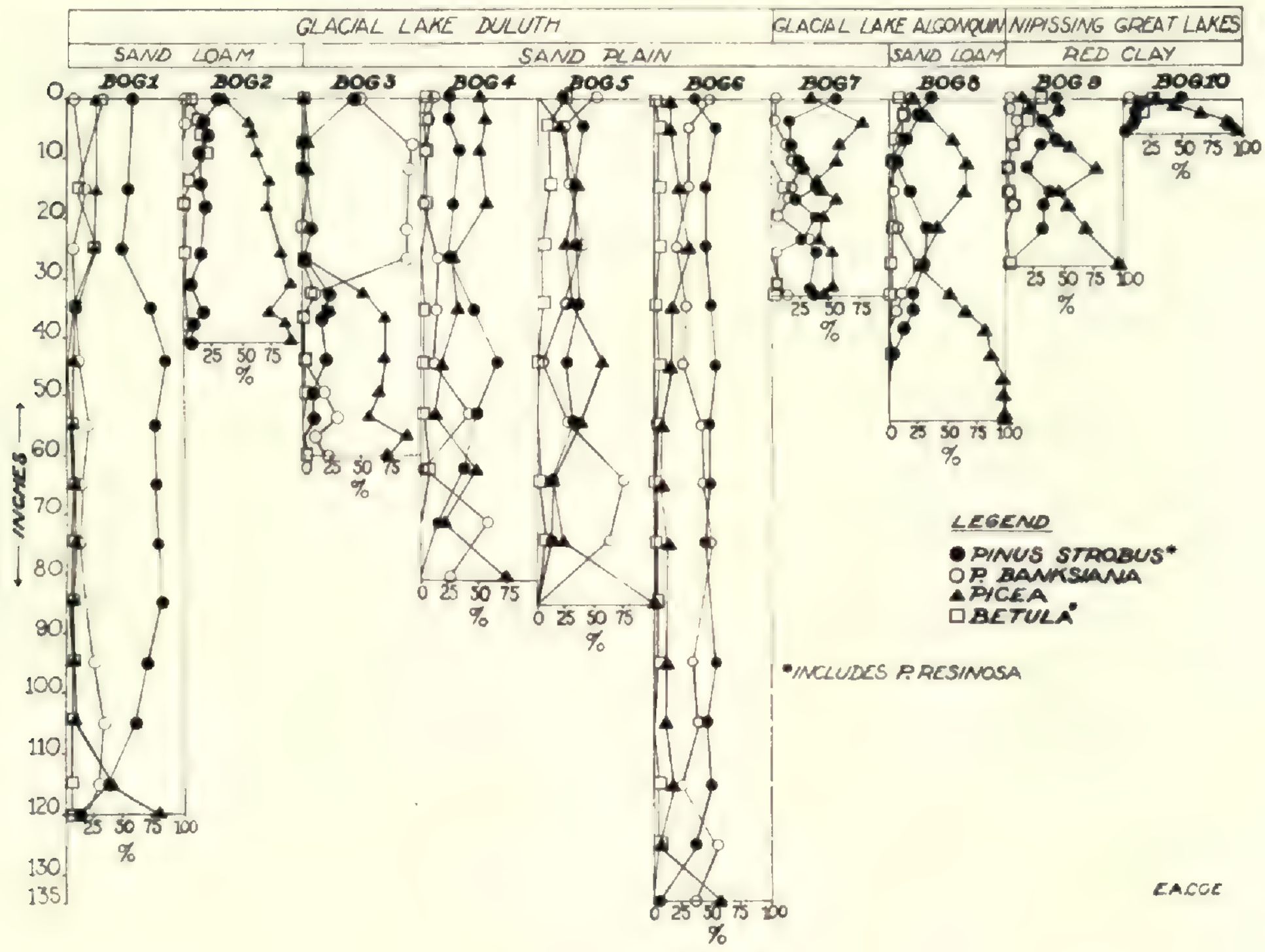
The upland flora is much more dense than it is around Bog No. 3. There are many trees of *Pinus resinosa*, *P. Banksiana*, *Betula papyrifera*, *Populus tremuloides*, and a few scattered trees of *Abies balsamea* and *Tilia americana* on the hillsides. The shrubs are *Salix sp.*, *Alnus incana*, *Myrica asplenifolia*, and *Rosa sp.* The herbaceous plants are *Aster sp.*, *Liatris sp.*, *Solidago sp.*, *Rubus sp.*, and *Andropogon furcatus*.

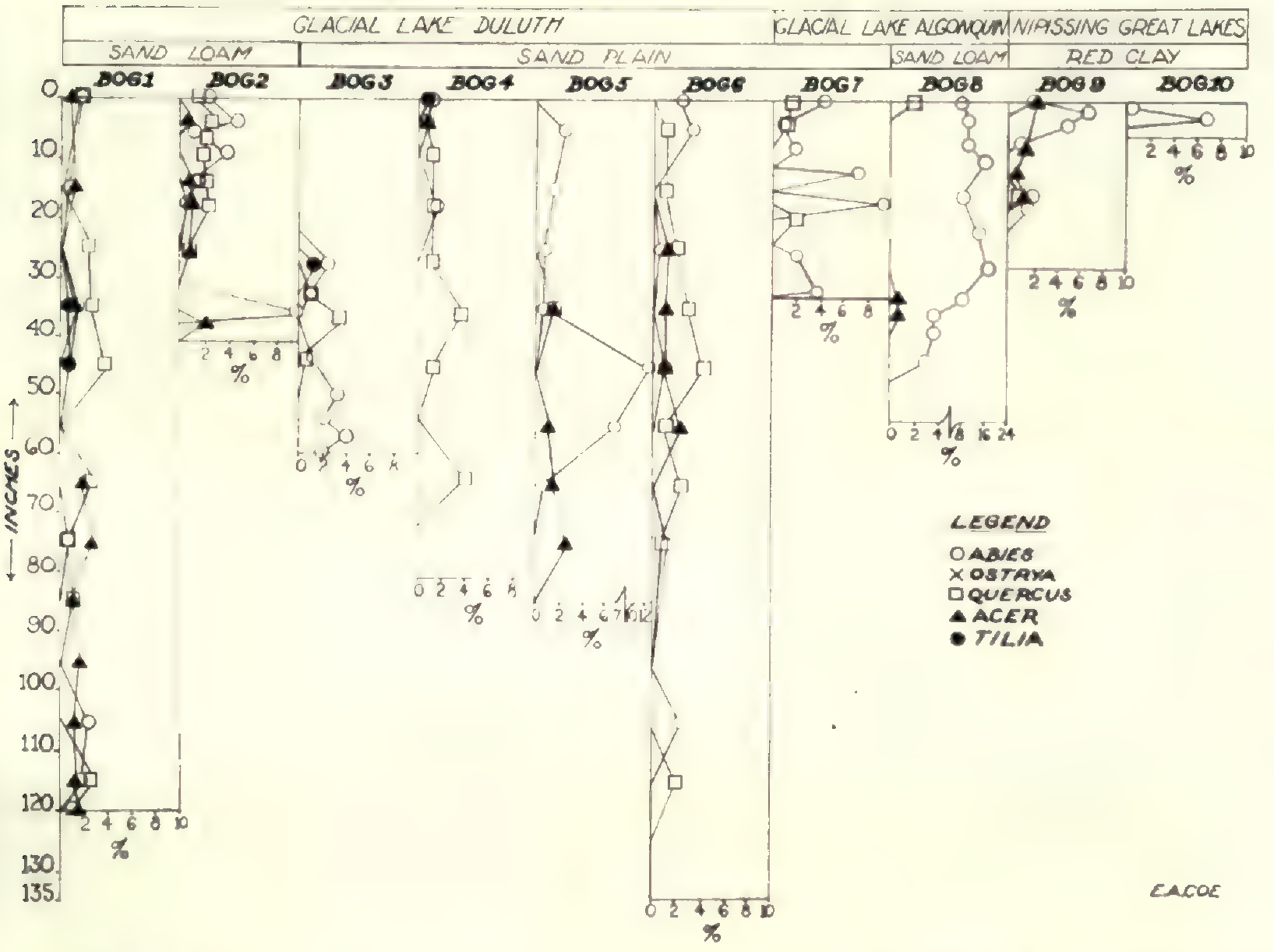
Bog No. 5.—On the north side of County Highway N. in Section 21, Township 45 North, Range 11 West.

The area of this deposit is about one-quarter of an acre. Three test-pits were studied and the deepest was found to be eighty-four inches. The mineral soil underlying the peat is a silty sand. It was mixed with considerable organic material to a depth of one inch below the contact and was found to contain microfossils in comparative abundance. The topography of the area about Bog No. 5 is developed in a pitted outwash plain.

The lowest forty inches of peat in this deposit appears to be entirely of the limnic type and through a transition layer nearly ten inches thick it grades into a woody *Sphagnum* moss peat. This latter type is found upward to within eleven inches of the surface in the middle of the bog and there the peat is a compacted layer of *Sphagnum*.

This bog is oval in shape and there are three zones of vegetation concentrically arranged on its surface. The center zone is covered





FIGS. 7 (above) and 8 (below), Graphs showing Percentages of Tree-pollen in the Douglas County, Wisconsin, Peat-deposits. Percentages computed from TREE-POLLENS only.

by a thick mat of *Sphagnum spp.* and *Polytrichum strictum.* On this there is growing a small clump of *Chamaedaphne calyculata.* The zone surrounding the *Sphagnum* is one of *Carex sp.* and contains a number of small trees of *Pinus Banksiana,* and *Populus tremuloides.* The third and outer zone is made up of a dominant cover of *Rubus sp.* and a number of small trees of *Populus tremuloides.*

The upland flora has suffered greatly from a recent forest fire, but no evidence of this fire was found on the bog. The vegetation of the surrounding sandy hillsides is meager and is composed largely of small trees of *Pinus Banksiana, P. resinosa,* and *Quercus ellipsoidalis.* The herbaceous vegetation is largely of a prairie character with *Aster sp., Solidago sp.,* and *Liatris sp.* dominating.

Bog No. 6.—Bog No. 6 is located on the west side of County Highway H in Section 13, Township 45 North, Range 10 West. It lies in a kettle-hole between Murray and Sand Lakes and during normal years it contains a little water over a mat of *Carex* peat. In 1933 this deposit was studied and during that year and the succeeding, no water stood in the basin of the depression.

The area of the whole deposit is probably less than one-sixth of an acre. The deepest boring was made near the center of the bog, and sand was encountered at one hundred and thirty-five inches below the surface.

The depression in which Bog Number 6 has developed, as well as those in which are located the nearby lakes, are kettle-holes left by ice-blocks in a pitted outwash plain. The upland soils are outwash sands and gravels.

The whole profile of peat in this bog must be considered as limnic in origin except possibly for the *Carex* tissues which accumulate on the surface of the deposit during dry periods. During the last few years this has been the only source of building material that has accumulated in the depression. It is quite possible that in the development of this deposit we have now a transition type of peat in the process of formation. What may follow is a matter of conjecture based upon observations of other profiles in the region. It is quite possible that a *Carex* peat will succeed the peat now forming and as the deposit matures, this will be succeeded in turn by a *Sphagnum* and *Polytrichum* moss cover. Another trend is also possible if the *Carex* peat becomes modified by weathering agents. This alternative is the invasion of the bog area by deciduous trees and shrubs.

The bog cover when studied was composed of a number of species of sedges and species of *Solidago* and *Eupatorium*. Around the bog are shrubs of *Salix spp.*, and *Alnus incana*. The flora on the surrounding upland is a thin second growth forest chiefly composed of *Pinus resinosa*, *P. Banksiana*, *Quercus ellipsoidalis*, and *Betula papyrifera*.

Peat Deposits of Pro-Glacial Lake Algonquin Age

With the uncovering of a lower outlet for the waters held between the front of the retreating ice in the Lake Superior Basin and the hills which surround the basin, the water level in Lake Duluth dropped to that occupied by Lake Algonquin. As a result of this drop in water level there was exposed a narrow strip of land upon which vegetation could establish itself (Fig. 3).

The general gradient of the exposed strip of land is comparatively steep and consequent drainage has been so vigorous that it has cut back into the headland and has perfected the run off to a marked degree. This has resulted in the leaving of very few undrained depressions in which organic sediments could accumulate. This fact and the narrowness of the newly exposed land area are the two factors which seem to explain the scarcity of peat deposits which began their formation with the establishment of the best known level of Lake Algonquin in Douglas County.

Bog No. 7.—Bog Number 7 is located on the east side of County Highway H in Section 3 of Township 46 North and Range 10 West. It was formed in an undrained depression on the highest terrace of the Brule River.

The area of the entire deposit is less than one-half acre and the deepest test pit was thirty-three inches. At that depth a blue clay was encountered. The soils of the surrounding area are sandy and contain some river-gravels and large boulders.

This deposit began its development with the fall of the water in Lake Duluth and the disuse of the highest terrace in the Brule River valley. Whether the cutting of the next lower terrace marked the end of Lake Duluth and the beginning of Lake Algonquin is not known, but the time interval between the use of the highest terrace and the cutting of the next lower must have been considerable, and if the assumption that this deposit is of Pro-Algonquin age is incorrect, it is at least much younger than those deposits already discussed. It is stated above that Lake Duluth drained by way of the Brule and

St. Croix rivers and that this stage of the Glacial Great Lakes persisted for a rather long period of time. It is assumed that vegetation spread northward very shortly after the region was uncovered by the Mankato ice. If that is true the outlet river of Lake Duluth was bordered by forests long before Bog Number 7 emerged from the bed of the glacial lake outlet. The distance from the bog-deposit to the ancient river-bank is less than two hundred yards, therefore it seems reasonable to suppose that in the earliest sediments that accumulated in the depression will be found microfossils from the vegetation of the hillside. The presence of these will then give the basal deposit nearly the same spectrum as is found at higher levels in other deposits not similarly situated.

In this deposit three layers of charcoal were found. These were at 17, 12, and 9 inches, respectively, below the surface in the deepest test pit. The lowest seven inches of peat is decidedly of an aquatic type and above that level the peat contains wood and some moss tissues. The top cover is a dry *Sphagnum* with sedges, *Ledum groenlandicum*, *Chamadaphne calyculata*, *Alnus incana*, *Betula pumila*, *Salix sp.*, *Larix laricina*, *Abies balsamea*, and *Picea mariana*. These plants form a dense tangle over the bog area.

The upland flora north of the bog contains many large trees of *Pinus resinosa*, and *P. Strobus*. Other trees of the area are *Populus grandidentata*, *Betula papyrifera*, *Quercus ellipsoidalis*, and *Pinus Banksiana*.

Bog No. 8.—This deposit is located on the east side of County Highway E approximately two and one-half miles north of the village of Lake Nebagamon in Section 13 of Township 47 North, and Range 11 West.

According to the map prepared by Hansell (l. c.) this bog is located between two islands that existed in Glacial Lake Duluth. The map prepared by Leverett ('28) does not show the presence of these islands. Instead he indicates that there was a slight invagination in the coast line of Lake Duluth, and though this does not definitely extend over the entire area of the bog, the probability of that extension is great.

The full extent of the bog was not investigated, but it probably covers more than forty acres. In the deeper test pit, contact with blue clay was found at fifty-four inches below the surface. The lowest eighteen inches of peat are of limnic origin and above that level a black, woody peat is present.

The present bog contains little *Sphagnum* and the mesophytic cover suggests that the peat is undergoing surface modification. This contains such plants as *Osmunda regalis*, *Thuja occidentalis*, *Abies balsamea*, *Betula lutea*, *Fraxinus pennsylvanica*, var. *lanceolata*, *Alnus incana*, *Nemopanthus mucronata*, *Cornus stolonifera*, and species of *Rubus*, *Aster*, *Solidago*, and *Gramineae*.

The upland flora is composed of a young, mixed, second growth forest in which *Populus tremuloides*, *Betula papyrifera*, *Pinus Strobus*, *P. resinosa*, *Acer saccharum*, *Quercus ellipsoidalis*, and *Prunus pennsylvanica* are important members.

Peat Deposits of Pro-Nipissing Great Lakes Age

With the gradual northeastward recession of the ice mass in the present Lake Superior basin a continuous drop in the level of Glacial Lake Algonquin resulted. Finally an outlet was established via the Ottawa River and the water fell to the level known as the Nipissing Great Lakes. At the west end of the Lake Superior basin this level was below that of the present lake, and part of this area has since been submerged as the result of differential uplift in the region of Lake Superior. Upon the newly exposed area forests soon became established. This is indicated by the presence of buried peat-beds near the Apostle Islands, Bayfield County, Wisconsin (Wilson, '35) and off Minnesota and Wisconsin Points at the west end of Lake Superior. The age of the peats is considered to be the same as the One Outlet Stage of the Nipissing Great Lakes. An examination of peat from the Apostle Islands Region shows that is was formed in association with a complex flora and the material that was recovered for study did not include basal strata containing the usual pioneer flora of *Picea*.

The belt of Pro-Lake Nipissing land at present exposed above Lake Superior probably ranges from twelve to thirty miles wide (Fig. 4). This land area has a gentle slope toward the lake and may be justly described as a lake-plain. Upon the plain in a few undrained irregularities peat soils have accumulated. Two of these deposits have been examined in detail.

Bog No. 9.—This deposit is located on the west side of 58th Street and Hammond Avenue in South Superior. It is in Section 2 of Township 48 North and Range 14 West. The area of Bog Number 9 is about one acre in extent.

The basin in which the peat has accumulated is an undrained irregularity in the lake-plain. The origin of the depression may be a meander-channel of the Nemadjii River that was abandoned very early.

Percentages of Microfossils in Bog No. 9, Douglas County, Wisconsin

Species	Depth in Inches									
	28	*22*	*18*	*16*	*12*	*8*	*7*	*4*	*2*	*0*
Sphagnum	7	2	38	17.5	30	55	67	75	21	2
Lycopodium annotinum	0	0	0	1	0	0	0	0	0	1
L. clavatum	1	0	0	0	0	0	0	0	0	0
Pinus Strobus & P. resinosa	0	30	17	29	13	13	13.5	6	21	21
P. Banksiana	0	0	4	3.5	.5	3	1.5	2	1	1
Picea	79	68	30	38	54	24	14	7	10	7
Abies	0	0	1	1.5	0	0	.5	1	3	1
Gramineae	12	0	.5	0	0	0	0	0	0	5
Salix	0	0	.5	.5	0	.5	.5	0	0	0
Betula	1	0	3	3	.5	2.5	2.5	4	9	14
Alnus	0	0	1	2	0	0	0	3	4	2
Quercus	0	0	0	.5	0	0	0	0	0	0
Acer	0	0	0	1	.5	0	0	0	0	1
Ericacea	0	0	3	1.5	1.5	1	.5	1	5	6
Compositae	0	0	2	1	0	1	0	1	26	39

Percentages of Microfossils in Bog No. 10, Douglas County, Wisconsin

Species	Depth in Inches					
	6	*5.5*	*4*	*2.5*	*1.5*	*0*
Sphagnum	2	0	2	0	2	0
Polypodiaceae	0	0	0	0	2	0
Lycopodium annotinum	10	20	6	6	4	2
L. clavatum	1	0	2	2	4	4
Pinus Strobus & P. resinosa	1	7	8	6	8	24
P. Banksiana	1	0	0	0	0	2
Picea	85	72	80	36	26	8
Abies	0	0	0	4	16	0
Gramineae	0	0	0	0	2	0
Salix	0	1	0	2	0	0
Betula	0	0	0	10	10	12
Alnus	0	0	0	28	10	18
Compositae	0	0	2	6	16	30

Three test-pits were studied and the deepest was found to contain twenty-eight inches of peat. The peat was found to be in contact with blue clay, and the lower six inches appear to be limnic in origin. The peat above that level is distinctly of a woody type which contains much *Sphagnum* moss tissues.

This bog is fast being destroyed by burning and civic improvements, but when studied in 1933 it was covered by a dry *Sphagnum* mat upon which a few small trees of *Picea mariana* grew and in addition the following heaths were abundant: *Ledum groenlandicum*, *Chamaedaphne calyculata*, and *Vaccinium Vitis-Idea*, var. *minor*. The occurrence of the last species is of special interest because at the present time this is one of the two known stations for it in Wisconsin. It is more abundant on the north shore of Lake Superior. The persistence of this subarctic plant on Bog Number 9 is an argument for the bog's continuous development from early Lake Nipissing time.

The upland vegetation is a sparse second growth cover of *Alnus incana*, *Betula papyrifera*, *Abies balsamea*, *Salix sp.*, *Pinus Strobus* and *Populus tremuliodes*.

Bog No. 10.—Bog No. 10 is located on the west side of a township road that reaches the mouth of the Brule River from U. S. Highway 13. The bog is in Section 16 of Township 49 North, and Range 10 West.

Like the preceding deposit this one is in an undrained depression of the lake-plain. The area of the deposit is not more than five hundred square feet and its maximum depth is only six inches. Below the peat the soil is a heavy pink clay.

When the peat materials were collected there was some doubt concerning the possible use of this deposit, but upon examination the same type of spectrum as found in other deposits was recognizable though much compressed. No oxidation of the peat was found. The nature of the peat varies considerably through the shallow profiles. The surface peat is composed of a loose mat of *Sphagnum* moss; below this and to a depth of two and one-half inches the peat is fibrous and somewhat woody; the next underlying peat-type is completely homogeneous and extends downward to the five-inch level, where the peat becomes a mixture of mineral and organic sediment one inch thick.

The flora of the bog and surrounding area is such as is found growing on clay soils in the Lake Superior Region. The dominant trees are *Abies balsamea*, *Picea mariana*, *Betula papyrifera*, and *Populus tremuloides*. The dominant shrub is *Alnus incana*. The herbaceous flora is composed of *Cornus canadensis*, *Clintonia borealis*, *Aralia nudicaulis*, several species of *Aster*, *Petasites sp.*, *Lycopodium annotinum*, and *L. obscurum*.

Comparative Studies of Fossil Spectra in Northwestern Wisconsin

It is generally conceded that under normal sedimentation and peat development a profile study of the microfossils in a bog deposit will give an accurate record of the preservable organic succession. That this record begins with the immediate formation of the basin in which sediments may accumulate is not reasonable to expect, but that the record began very early after the basins were formed in Douglas County, Wisconsin, is strongly suggested by the evidence already discussed. The bogs which present this evidence are among the oldest in the region and it may be logically assumed that the younger bogs likewise record the earliest sediments containing microfossils in their respective areas since it has been shown that vegetation was in the region during Pro-Lake Duluth time. An examination of the lowest peat horizon always reveals a predominance of fossil *Picea* pollen. The species of this genus are considered to be pioneers and their appearance in Douglas County in the basal levels of all peat deposits also indicates the perfection of the fossil record.

The dating of the various peat levels must necessarily be somewhat hypothetical until more information is accumulated, but we can at present state definitely the age of the surface layer and with some certainty the basal levels. The dating of the other levels cannot be made by determining a rate of peat development, as is done by Sears and Janson ('33), and using that as a measurement of time. This is evident when one compares the depth of contemporaneous deposits (Fig. 7). There are many variables that determine peat development and each bog appears to have its own particular rate of building. The use of specific fossil percentage-curves to arrive at even an approximate comparison in bogs of different ages was found unsatisfactory in Douglas County. Even the rate of peat development in a single deposit cannot be considered to have been uniform from its earliest formation. It is reasonable to expect that as a peat deposit matures its rate of formation will be accelerated, because in its early stages the organic sediments are usually much more modified by bacteria and, as the lake-basin with its body of water matures, the organic sediments become coarser and consequently the sedimentation is more rapid. For this reason it is impossible even to compare the various contemporaneous sections. The similarity of certain percentage-curves is significant and these appear to be the best means

of age-comparison within short distances. However, this is a successional comparison and does not specify a definite date. As stated above, the greatest difficulty in correlation appears when bogs of different ages are compared and unfortunately this is the comparison of most value in determining the vegetational history of the region. The unsatisfactory attempts to use the rates of sedimentation and fossil spectra as geological time markers leaves only one method of estimating a division of the postglacial time occupied by the lakes in the Lake Superior Basin. This is a comparison of the shore work accomplished by each of these lakes. According to Martin (page 463 l. c.) "it seems possible that the present stage of Lake Superior has not existed as long as did the Nipissing Great Lakes." His evidence for this statement is the amount of shorework left by this lake stage. The beaches are higher and broader than the preceding two lake stages and upon comparison of these and also those of Lake Superior it seems reasonable to conclude that Glacial Lake Nipissing time may be placed approximately half way back to the uncovering of the region from ice. Also, upon a somewhat arbitrary basis, the remaining previous time has been divided one half into that occupied by Glacial Lake Duluth until it fell to the level of Glacial Lake Algonquin, and one half into the time occupied by this latter lake until it in turn dropped to the Nipissing Great Lakes stage. This division is, admittedly, open to some criticism but it does have some supporting evidence and until a better subdivision of postglacial time in Douglas County is suggested this appears to be the best available.

If an examination is made of the fossil spectra from the surface of the bogs in Douglas County and then compared with the map of the present vegetation (Fig. 6) a marked similarity is evident. This close correlation between the fossil spectra and map of the present vegetation is a very good demonstration of the value of the paleoecological technique in determining plant distribution.

Pursuing further the suggestion of the above correlation between the microfossils and plant distribution, an attempt was made to determine the type of forests and their distribution at the time of the various glacial lake stages. An examination of the lowest levels in the depressions, which were in existence during Glacial Lake Duluth time indicates that throughout the county, spruce (*Picea*) forests were dominant. Upon the lighter soils of the county (Fig. 1) an additional tree was important with spruce. This was jack pine (*Pinus Banksi-*

ana). A vegetation map such as that shown in Fig. 2 is suggested by the spectra from the basal levels of the sediments contemporaneous with Glacial Lake Duluth.

A detailed examination of the lowest sample of peat taken from Bog No. 1 shows that among the microfossils present, two interesting plant species occur. These are internal leaf trichomes of Nymphaeaceae, and spores of *Lycopodium inundatum*. It is probable that these plants were distributed almost entirely by water and to make such distribution possible they must have been present in the region very early. It is quite certain that this bog was never connected with Lake Duluth, at least not during the period when the well marked beach was cut at the 1280 foot elevation. It has been shown by Leverett and Sardeson ('32) that the last advance of the glacial front in the region of Lake Superior was not a complete cover of ice over the area and that part of northern Minnesota was free, as well as most of northern Wisconsin. That plants were in existence on this uncovered drift (Substage 3 of Leverett) during the advance of the last ice is suggested by the fossil logs found at Solon Springs, Douglas County, Wisconsin, as already described.

McLaughlin (l. c.) has suggested that *Lycopodium inundatum* and certain species with Atlantic Coastal Palin affinity in northwestern Wisconsin are associated in their distribution with the Glacial Great Lakes. He further suggests that this distribution was an invasion from the Atlantic Coast and Gulf of Mexico during the recession of the last ice sheets and the existence of certain glacial lakes. The presence of the fossils of *L. inundatum* in the lowest levels of Bog No. 1 shows that it was one of the first plants in the region. It seems possible that this plant, as well as others, remained alive within the region during advance of the Mankato Ice. As this ice sheet melted the only source from which plants could enter very early upon the newly deposited soils would be from the north, west, or south and the earliest means of dispersal of seeds or spores by water would begin in the western end of Lake Superior and progress eastward with the melting of the ice in the lake bed. It seems more probable that *L. inundatum* and Nymphaeaceae sp. arrived at the location of Bog No. 1 from the west during the time of Lake Nemadjii or at a brief period of Lake Duluth, rather than over a soil barrier from the south.

The other fossil components of the basal sample of peat are *Pinus* 18%, *Picea* 72%, Gramineae 3%, *Betula* 1.5%, *Quercus* 1%, *Acer*

1.5%, and Compositae 1.5%. This fossil flora is the most varied of any basal deposit examined in Douglas County and it is interesting to note that it is not only one of the oldest deposits in the county but it is also the farthest west and was consequently closest to the source of early plant dispersal if that center was located as is noted above.

A compilation of the recognizable fossil species from the basal levels of peat in bogs of Pro-Glacial Lake Duluth origin suggests the following flora for Douglas County at that time.

Species	Bogs	Species	Bogs
Sphagnum sp.	4	P. mariana	1, 2, 3, 4, 5, 6
Drepanocladus revolvens	3	Abies balsamea	3
D. Wilsoni	3	Gramineae sp.	1
Calliergon trifarium	4	Betula sp.	1, 3
Lycopodium inundatum	1	Quercus sp.	1
Pinus Strobus	1, 6	Nymphaeaceae sp.	1, 3
P. resinosa	1, 6	Acer sp.	1
P. Banksiana	1, 3, 4, 6	Compositae sp.	1, 2
Picea glauca	1, 2, 3, 4, 5, 6		

Additional species, which occur as fossils slightly above the basal level, are as follows:

Species	Bogs	Species	Bogs
Lycopodium clavatum	1	Alnus sp.	1
Salix sp.	4	Ericaceae sp.	1

Reference to Fig. 7 shows that at this period *Picea* forests dominated the county and on the sandy areas *Pinus* early attained importance. Fig. 2 shows a generalized map of this vegetation.

A compilation of the fossils in the basal levels of the two bogs of Pro-Glacial Lake Algonquin origin suggests the following flora in their immediate areas:

Species	Bogs	Species	Bogs
Pinus Strobus	7	P. mariana	7, 8
P. resinosa	7	Betula sp.	7
P. Banksiana	7	Alnus sp.	7
Picea glauca	7, 8		

The formation of these two bogs has been discussed above, and it was pointed out that Bog No. 7 is located upon the highest terrace of the Brule River. When the basin of the bog formed, it was very close to an area that was already covered by forests which had passed the pioneer stage of succession. Consequently, the basal level in Bog No. 7 will include fossils from the adjacent highland as well as the fossils from plants which grew upon the terrace. Bog No. 8 might also present conditions similar to those of Bog No. 7 since it was close to

an area exposed when the Mankato Ice disappeared. However, an examination of the pollen spectrum of this bog shows that *Picea* forest alone fringed the shore of Lake Duluth and that this flora remained unchanged while at least four inches of peat was formed in Bog No. 8.

Seven inches above the contact of mineral soil and peat were found a few microspores of *Selaginella selaginoides*. The number of spores of this species increased from 2% of the spectrum at this level (47 inches) to 4.5% at 43 inches, and to 14% at the 39 inch level. It is interesting to note that today this species is found in Wisconsin only on the Door County Peninsula in Lake Michigan, and that the nearest known stations for it in the Lake Superior region are on Isle Royal, and at Grand Marais, Minnesota, and more than one hundred miles northeast of Bog No. 8.

The suggestion made by the percentage of *Picea* in the basal deposit of Bog No. 8, and the predominance of these fossils at the same position in Bog No. 7, appears sufficient to indicate that upon the soils newly exposed by the fall of water level, the pioneer vegetation near Lake Duluth moved north and established itself. This should be further shown when peat deposits in the western part of the county are discovered and studied.

In order to determine the flora in the remainder of the county at Pro-Glacial Lake Algonquin time, it is necessary to establish a level in each bog that will be comparable in time to this lake. The difficulty involved in this procedure has already been discussed and probably the best method at present is to consider that one-half of the peat in the Pro-Glacial Lake Duluth bogs has been deposited since early Nipissing time, one-fourth more during Algonquin time, and the additional one-fourth since Duluth time. A comparison of the basal spectrum of Bog No. 7 and earlier bogs might be made as a means of determining the comparable level, but local conditions make this determination difficult. The following comparison has been made and the plants listed below represent the fossil flora in the county at Pro-Glacial Lake Algonquin time. Species appearing between the Algonquin level and up to that of the Nipissing are included in the list.

Species	Bogs
Sphagnum sp.	1, 2, 3, 4, 5, 7, 8
Polypodiaceae sp.	7, 8
Lycopodium annotinum	1, 7, 8
L. clavatum	1, 3, 7
Selaginella selaginoides	8
Pinus Strobus	1, 2, 3, 4, 5, 6, 7, 8
P. resinosa	1, 2, 3, 4, 5, 6, 7, 8
P. Banksiana	1, 3, 4, 5, 6, 7, 8
Picea glauca	1, 2, 3, 4, 5, 6, 7, 8
P. mariana	1, 2, 3, 4, 5, 6, 7, 8
Larix laricina	1
Abies balsamea	1, 2, 3, 5, 6, 7, 8
Gramineae sp.	1, 6, 8
Cyperaceae sp.	8
Salix sp.	1, 2, 3, 4, 5, 8
Betula sp.	1, 2, 3, 4, 5, 6, 7, 8
Alnus sp.	1, 2, 3, 4, 5, 6, 7, 8
Quercus sp.	1, 2, 3, 4, 6, 7, 8
Q. ellipsoidalis (trichome)	6
Nymphaeaceae sp.	1
Acer sp.	1, 2, 5, 6, 8
Ericaceae sp.	1, 3, 4
Chamaedaphne calyculata (trichome)	1
Compositae sp.	1, 2, 3, 4, 5, 6, 7, 8

It will be noted that a distinction has been made in considering the fossils of *Pinus Strobus* and *P. resinosa* in the southeastern part of the county. These two species cannot ordinarily be safely distinguished as fossils. However, they are distinct within certain limits when fresh material is studied. In the southeastern part of Douglas County there appeared such an unusual abundance of forms characteristic of *P. resinosa* that this separation was made. It was also possible to do this in Bogs 1 and 2, but instead, *P. Strobus* is the dominating species.

A comparison of the graphs shown in Figs. 7 and 8 seems to indicate that very early in the vegetational history of the county the *Picea* forests gave way to forests of *Pinus*. On the sandy loam soils in the regions of Bogs 1 and 2 this succession was accomplished by *Pinus Strobus*, while on the light sandy soils in the southeastern part of the county it was first *P. Banksiana* and then *P. resinosa*. If one-fourth of the distance from the bottom in the first six bogs is comparable to Glacial Lake Algonquin time, then the vegetation of the county can be mapped as shown in Fig. 3.

It will be noted that the abundance of *Quercus* becomes significant between the one-fourth and the one-half levels from the bottom of the first six bogs. Though this percentage is small in comparison with that of the conifers, the importance of a small rise is significant because *Quercus* and other hardwoods produce comparatively less pollen per tree than the conifers.

With the fall in the water level of Glacial Lake Algonquin and the beginning of sediment-accumulation in the basins of Bogs 9 and 10, a record of the Nipissing vegetation was begun. As at the beginning of the two previous lake stages, the pioneer forests upon the newly exposed soils were composed of *Picea*. These forests appear to have moved north from the area they formerly occupied on the soils ex-

posed by the fall in the water level from the Lake Duluth stage to that of the Lake Algonquin stage. The Nipissing forests also moved out upon that part of the Nipissing plain now covered by Lake Superior. This is shown by the presence of submerged and buried peat beds in Lake Superior.

The fossils in the basal levels in Bogs 9 and 10 indicate that the following plant species were members of the first Nipissing flora.

Species	Bogs	Species	Bogs
Sphagnum sp.	9	P. Banksiana	10
Lycopodium annotinum	10	Picea glauca	9, 10
L. clavatum	9, 10	P. mariana	9, 10
Pinus Strobus	10	Gramineae sp.	9
P. resinosa	10	Betula sp.	9

In a submerged Nipissing peat bed located near the Apostle Islands, in Bayfield County, Wisconsin, a highly complex flora is indicated (Wilson, '35). The peat that was recovered from this deposit does not contain the pioneer vegetation comparable to that in the basal levels of Bogs 9 and 10. Yet this deposit, because of its location, is known to be of Early Nipissing Great Lakes age, and it is definitely known that the following additional plants were in northern Wisconsin at the Nipissing Great Lakes time.

Polypodiaceae sp.
Taxus canadensis
Larix laricina
Abies balsamea
Cyperaceae sp.
Carex crinita
Salix sp.
Alnus sp.
Quercus sp.
Acer spicatum
Ericaceae sp.
Chamaedaphne calyculata
Compositae (four genera)

If the level half way from the bottom of the Pro-Glacial Lake Duluth bogs is to be considered as the beginning of Nipissing Great Lakes time, the following vegetation was in existence within the area first uncovered by ice.

Species	Bogs	Species	Bogs
Sphagnum sp.	1, 2, 3, 4, 5	Betula sp.	1, 2, 3, 4, 5, 6
Pinus Strobus	1, 2, 3, 4, 5	Alnus sp.	1, 2, 3, 4, 5, 6
P. resinosa	1, 2, 3, 4, 5	Quercus sp.	1, 2, 3, 4, 5, 6
P. Banksiana	1, 3, 4, 5	Acer sp.	2, 5
Picea glauca	1, 2	Ostrya virginiana	2
P. mariana	1, 2, 3, 4, 5, 6	Ericaceae sp.	3, 4
Abies balsamea	2, 3, 5	Chamaedaphne calyculata	5
Gramineae sp.	5, 6	Compositae sp.	1, 2, 3, 4, 5
Salix sp.	2, 3, 4		

The fossils present in the Pro-Glacial Lake Algonquin bogs, Nos. 7 and 8, one-fourth of the distance from the bottom, are as follows:

Species	Bogs	Species	Bogs
Sphagnum sp.	7	Picea glauca	8
Polypodiaceae sp.	7	P. mariana	7, 8
Selaginella selaginoides	8	Abies balsamea	8
Pinus Strobus	7, 8	Gramineae sp.	8
P. resinosa	7, 8	Salix sp.	8
P. Banksiana	7		

The above flora with the addition of the plants previously recorded contains all of the important elements of the living flora of Douglas County. The indication is therefore that the present flora of Douglas County is essentially the same as it was in early Nipissing Great Lakes time, with the exception of the European element now present, and possibly some of the aggressive prairie species.

A study of the graphs in Figs. 7 and 8 as well as the tables of the ten bogs shows that at those levels assigned to early Nipissing Great Lakes time the forests were different on the various soil-belts of the same age as well as in the areas of different ages. The hardwoods now appear to have attained importance in the region exposed since Glacial Lake Duluth time. In the sandy loam belt they were probably of greater importance than on the light sandy soils. Upon the area formerly covered by the southern part of Glacial Lake Duluth *Pinus Strobus* was probably the most abundant tree and upon the Nipissing plain *Picea mariana* was the pioneer species. Today, there are still small areas where this tree is dominant on high ground near the shores of Lake Superior. The length of time during which this pioneer forest dominated the newly exposed soils at each lake stage apparently was not long for in practically every bog there is a marked decrease in the relative abundance of fossils of *Picea* a few inches above the bottom deposits. Figure 4 is suggested as a vegetation map for early Nipissing Great Lakes time.

The change from the Nipissing Great Lakes water level to the present Lake Superior level came about very gradually and there appear to have been no radical changes of the vegetation in Douglas County until levels were reached in the bogs that may be comparable to late historic time. This change is marked by an increase in the Compositae fossils and probably does not antedate the forests as they appeared in 1897 (Fig. 5). The marked rise in the Compositae fossils may have been in response to the extensive lumbering operations and fires which resulted in denuding the county of forests and in the uncovering of the soils. Upon these a prairie vegetation has intruded, and some early stages of plant succession have once again started.

An examination of the graphs of Fig. 7 usually shows two levels in the bogs where *Picea* is of marked importance. These are, first, at the bottom of the deposit and, second, at or near the top. A climatic significance has been attributed to this type of curve by some authors, but such a curve is also easily explained by a local succession of trees upon the bogs. It has been shown that the first forests upon the various soils of Douglas County were of *Picea* and the absence of other species of trees easily explains the dominance of *Picea* fossils in the basal levels of each deposit. With the appearance of other species in the region the relative abundance of *Picea* fossils would become less. Then as the lake or pond, in which organic sediments were accumulating, matured to a stage where a *Sphagnum* mat began to encroach upon the water area, *Picea* again would become an important tree, this time as a pioneer upon the organic soils of the bog. The association of *Picea* and *Sphagnum* is clearly shown by a corresponding increase in the microfossils of these species near the top of the deposit (see tables). In a study of limnic and subäerial peat in one bog (Wilson and Galloway, '37) the second rise in *Picea* was found to be contemporaneous with the transition of the peat from limnic to subäerial. In several of the peat deposits a second drop in the *Picea* curve is evident and this might be taken to indicate that the peat itself has undergone modification, such as oxidation, and trees from the upland have become established upon the deposit. There is also another possibility for such a drop. This is a denudation of the bog by fire and an earlier deciduous tree recovery on the upland.

If the several forest trees, which have fossil representation in the peat sections and are indices to the stages of forest succession, are listed as to their relative distance from the surface of each bog where they first reached an important or maximum microfossil percentage, the following very interesting table will be constructed.

A Comparison of the Relative Depth in per cent from the Top of each Bog where certain Fossil Tree Pollens first attained marked Abundance

Species	*Pro-Glacial Lake Duluth Origin*						*Lake Algonquin Origin*		*Great Lakes Origin*	
	Bog 1	Bog 2	Bog 3	Bog 4	Bog 5	Bog 6	Bog 7	Bog 8	Bog 9	Bog 10
Ostrya . . .		.43								
Tilia	.37		.43	.00						.00
Quercus . .	.54	.43	.59	.77	.41	.85	.60	.00	.57	
Acer	.62	.92			.88	.40		.66	.57	
Pinus	.87	.87	.87	.88	.88	.92	100	.79	.71	.91
Picea	100	100	100	100	100	100	100	100	100	100

It will be noted in the table that the maximum of *Picea* is in the basal levels of all the bogs studied, and that next in order, *Pinus* appears in abundance at almost a uniform level. There is particularly a marked similarity in the occurrence of *Pinus* in the bogs of Pro-Glacial Lake Duluth origin. The basal occurrence of the *Pinus* maximum in Bog 7 can be explained by the geographic location of the deposit. This has been discussed. The first abundance of the other tree fossils also shows marked similarity in their relative stratigraphic appearance regardless of their ages. Such a similarity of appearance might be considered to indicate that there were but brief intervals between the lake stages and that the vegetation did not make a general invasion into the region until near the beginning of the Nipissing Great Lakes. This is necessarily discounted by the great amount of shore work accomplished by each of the glacial lakes, indicating great lapses of time between the stages, by the sharp contacts of peat and clay soils in Bogs 3 and 4, and by evidence which the fossil logs discovered at Solon Springs present as to the proximity of the vegetation to the Mankato Ice border. Instead, the great similarity of appearance may further demonstrate the order and uniformity of the *Picea*, *Pinus*, and hardwood forest succession on the soils of different ages in Douglas County, Wisconsin.

Summary

1. In ten peat bogs of Douglas County, Wisconsin, the microfossil succession has been studied.

2. The bogs were selected with reference to the shorelines of Glacial Lakes Duluth and Algonquin, and the Nipissing Great Lakes in order that a comparison of their fossil spectra could be made and the vegetational history of the region might be determined.

3. A survey of the present vegetation of Douglas County shows that it is definitely related in its distribution to the soils of the county.

4. Comparative studies of the fossil spectra under discussion indicate that upon each area of land that was progressively uncovered by the waters of the glacial lakes there developed a pioneer forest of *Picea*. The subsequent vegetational development upon these areas appears to have been in response to the soils.

5. The general plant succession suggested by the microfossil studies on the heavier soils of the county appears to have been (1) *Picea*, (2) *Pinus* forest, (3) hardwood forests, and (4) mixed second growth hardwood forests with an additional important Compositae element. The general floral succession on the lighter sandy soils appears to have been (1) *Picea* and *Pinus Banksiana* forest, (2) *Pinus resinosa*, *P. Banksiana*, and *Quercus ellipsoidalis* forest, and (3) a second growth *Pinus Banksiana* and prairie vegetation.

6. Changes in certain pollen percentages in the spectra may also be explained upon the basis of some local ecological factor other than climate.

The writer wishes to express his appreciation to Dr. N. C. Fassett of the Department of Botany, of the University of Wisconsin, and to Prof. F. T. Thwaites, of the Department of Geology, of the University of Wisconsin, for their criticism and suggestions, to Mr. W. H. Burrell, Director of the University Herbarium, Leeds University, for invaluable assistance in the early stages of the problem, and to Drs. W. S. Cooper, F. K. Butters, G. D. Fuller, C. O. Rosendahl, and P. B. Sears for reading and criticising the manuscript.

Coe College,
Cedar Rapids, Iowa

Bibliography

Aldrich, N. R. and N. C. Fassett. 1929. Botanical and Geological evidence for an ancient lake. Science n. s. **70:** 45–46.

Auer, V. 1930. Peat bogs in southeastern Canada. Can. Geol. Surv. Mem. **162:** 1–32.

Caine, T. A. and W. S. Lyman. 1905. Soil survey of the Superior Area, Wisconsin-Minnesota. U. S. Dept. of Agri., Bur. of Soils. Washington.

Bordner, J. S. and others. 1933. Douglas County. Wis. Dept. of Agr. and Markets. Bull. No. 146.

Draper, P. 1929. A comparison of pollen spectra of old and young bogs in the Erie Basin. Proc. Okla. Acad. Sci. **9:** 50–53.

Fassett, N. C. 1929. Preliminary reports on the flora of Wisconsin. II. Ericaceae. Trans. Wis. Acad. Sci., Arts, and Lett. **24:** 257–268.

———— 1930. Preliminary reports on the flora of Wisconsin. V. Coniferales. VII. Betulaceae. VIII. Aceraceae. Trans. Wis. Acad. Sci., Arts, and Lett. **25:** 177–182, 189–194, 195–197.

Gleason, H. A. 1922. The vegetational history of the middle west. Ann. Assoc. Am. Geogr. **12:** 39–85.

Hansell, J. M. 1930. Glacial geology of an area in the northwestern corner of Wisconsin. Ph.D. thesis (unpublished) Univ. of Wis.

Leverett, Frank. 1928. Moraines and shore lines of the Lake Superior Region. U. S. Geol. Surv. Prof. Paper 154-A.

Leverett, F. and F. W. Sardeson. 1932. Quaternary geology of Minnesota and parts of adjacent states. U. S. Geol. Surv. Prof. Paper 161.

Martin, L. 1932. The Physical Geography of Wisconsin. Wis. Geol. and Nat. Hist. Surv. Bull. 36.

McLaughlin, W. T. 1932. Atlantic Coastal Plain plants in the sand barrens of northwestern Wisconsin. Ecol. Mon. **2:** 335–383.

Roth, Filibert. 1898. Forestry conditions and interests of Wisconsin. Bull. 16. U. S. Dept. Agric. Div. Forestry.

Sears, P. B. 1930. A record of postglacial climate in northern Ohio. Ohio Jour. Sci. **30:** 205–217.

———— 1931. Pollen analysis of Mud Lake bog in Ohio. Ecol. **12:** 650–655.

———— 1932. Postglacial climate in eastern North America. Ecol. **13:** 1–6.

Sears, P. B. and Elsie Janson. 1933. The rate of peat growth in the Erie Basin. Ecol. **14:** 348–355.

Taylor, F. B. 1912. The glacial and post-glacial history of the Great Lakes region. Rept. Smithsonian Inst. 291–327.

———— 1931. Submerged peat beds among the Apostle Islands. Science n. s. **74:** 265–267.

THWAITES, F. T. 1934. Outline of Glacial Geology. Edwards Brothers, Inc. Ann Arbor Mich.
WILSON, L. R. 1932. The Two Creeks Forest Bed, Manitowoc County, Wisconsin. Trans. Wis. Acad. **27:** 31–46.
———— 1935. A Nipissing flora of the Apostle Island Region of Wisconsin. Bull. Torr. Bot. Club. **62:** 533–535.
———— 1936. Further studies of the Two Creeks Forest Bed, Manitowoc County, Wisconsin. Bull. Torr. Bot. Club. **63:** 317–325.
WILSON, L. R. AND E. F. GALLOWAY. 1937. Microfossil succession in a bog in northern Wisconsin. Ecol. **18:** 113–118.

NOTES ON THE LOBELIAS IN THE HERBARIUM OF STEPHEN ELLIOTT

ROGERS MCVAUGH

WHILE in Charleston, South Carolina, in June 1937, the writer had the opportunity, through the kindness of Mrs. Frances Barrington and Mr. Robert Lunz, Jr., of the staff of the Charleston Museum, to examine the Lobelias in the herbarium of Stephen Elliott. The Elliott collection was of special interest because of the uncertain application of the names of several Lobelias mentioned in the "Sketch."[1] "*Lobelia amoena* Mich.," "*Lobelia Claytoniana* Mich.," "*Lobelia puberula* Mich." and "*Lobelia pallida* Muhl." are all included by Elliott, and, as type material of these species has so far not been found, it was thought his herbarium, being nearly contemporaneous with those of Michaux and Muhlenberg, might throw some light upon the identities of the above species. It was hoped to discover also the identity of *L. puberula* var. *glabella* Elliott.[2]

The collection now contains sixteen specimens of the genus *Lobelia*, all from the United States. Following is the complete list:

1. L. CARDINALIS L. No data with specimen.
2. L. SIPHILITICA L. No data with specimen.
3. L. ELONGATA Small. Labelled "*L. amoena?* Mich." and "Hab. in humidis."
4. L. GLANDULOSA Walt. Labelled "in humidis" and with what is apparently a corruption of Michaux's *L. crassiuscula*.
5. L. PUBERULA Michx. Labelled "*L. puberula* Mich." and "hab. in humidis."
6. L. SPICATA Lam., var. LEPTOSTACHYS (A.DC.) Mack. & Bush. Two specimens: one labelled "Carol. Sept. Dr. Schweinitz" and with an unpublished name credited to Schreber; the other labelled "*L. Claytoniana;* hab. juxta Columbiam, S. C., Mr. Herbemont."

[1] ELLIOTT, STEPHEN. A Sketch of the Botany of South Carolina and Georgia 2 vols. Charleston, 1816–1824.

[2] ELLIOTT, op. cit. 1: 267.

7. L. SPICATA Lam., var. ORIGINALIS McVaugh. No data with specimen? This plant is on the same sheet with the next, and it is possible that the data given are meant to apply to both.

8. L. SPICATA Lam., var. SCAPOSA McVaugh. Labelled "*Lobelia pallida*. Hab. Mar. Mr. Oemler." Also labelled with a capital "P" which begins a word; the rest of the word has been torn off, and may possibly have been "Penn," indicating that the plant came from Maryland or Pennsylvania.

9. L. INFLATA L. Two specimens: one labelled "Mr. Percival"; the other labelled "Hab. Penn."

10. L. PALUDOSA Nutt. Labelled "hab. St. Mary's, Georg. Dr. Baldwin."

11. L. NUTTALLI R. & S. Two specimens: one labelled "*L. gracilis*" and "Hab. Carol. Sept. Dr. Schweinitz"; the other labelled "*L. Kalmii*. Mai-Aug. in humidis frequens."

12. L. KALMII L. Two specimens: one labelled "Mr. Whitlow, New York"; the other was sent to Elliott by John Torrey and is labelled with an unpublished name of Eddy's and "in the western part of the state of New York (Eddy)."

Reference to the above list enables us to place some of Elliott's names with certainty. He lists in the "Sketch" a total of 9 species, of which 4 (*L. Cardinalis*, *L. siphilitica*, *L. puberula*, *L. inflata*) are plainly the species now known by the same names. His interpretation of "*L. glandulosa* Walt." is probably the same as the modern one, while his "*L. Kalmii*" of Carolina and Georgia is *L. Nuttalli* R. & S.

As previously pointed out,[1] the identity of *L. amoena* Michaux is not surely known; his description[2] may apply to what is now called *L. elongata* Small. The presence of a plant of the latter species, labelled "*L. amoena*? Mich.," in Elliott's herbarium, makes it probable that "*L. amoena*" of the "Sketch" was not the mountain and upland plant now passing by that name, but the Coastal Plain species native about Charleston. Since the elder Michaux also was familiar with the low country of South Carolina, it may well be that his "*Lobelia amoena*" refers to the same plant and that we are using the name wrongly at present. Until evidence to the contrary is presented, however, we must use Small's name for the coastal plant.

Another specific name of somewhat doubtful application is Michaux's *Lobelia Claytoniana*. It was referred by the writer[3] to *L. spicata* var. *originalis*, but a recent letter from Professor F. E. Wimmer of

[1] RHODORA **38**: 283. 1936.
[2] Fl. Bor.-Am. **2**: 153. 1803.
[3] RHODORA **38**: 308. 1936.

Vienna states that in the Delessert Herbarium there is a specimen of *L. Claytoniana*, sent by Michaux himself, which differs from *L. spicata* Lamarck by the presence of well-marked calyx-appendages. Professor Wimmer considers this plant to be closely related to, or identical with, *L. leptostachys* A.DC. In view of these facts, it is interesting to see that Elliott's "*Lobelia Claytoniana*" from Columbia, S. C. is the plant now known as *L. spicata* Lam., var. *leptostachys* (A.DC.) Mack. & Bush.

In the "Sketch"[1] the author states that he has seen material of "*Lobelia pallida*" from Pennsylvania, Tennessee, St. Mary's, Georgia and the low country of South Carolina. His herbarium indicates that "*L. pallida*" from Pennsylvania was *L. spicata* var. *scaposa*, and that that from St. Mary's, Ga., was *L. paludosa* Nutt. This bears out the conclusions previously stated by the present writer.[2]

The only new name proposed by Elliott was a variety *glabella* of *Lobelia puberula*, referred to above. The type locality was given as Chatham Co., Georgia. This variety was said to be very smooth, with linear-lanceolate leaves, and to be a possible intermediate between *L. puberula* and *L. glandulosa*. No material of it was found in the Elliott herbarium, so that the correct application of the name remains in doubt. However, the description given by Elliott leads one to suppose that he had in mind a smooth, nearly eglandular plant of *L. glandulosa;* such individuals are not uncommon in that species. *L. puberula* var. *glabella* Ell. probably does not refer to *L. elongata* Small, however, as was previously stated;[3] Elliott was evidently familiar with *L. elongata*, under the name of "*L. amoena*."

University of Georgia

NEW COMBINATIONS AND UNDESCRIBED FORMS FROM MISSOURI

Julian A. Steyermark

All specimens cited below may be found in the Herbarium of the Missouri Botanical Garden.

Lophotocarpus calycinus (Engelm.) J. G. Smith, forma **fluitans** (Engelm.) Steyermark, comb. nov., *Sagittaria calycina* var. *fluitans* Engelm. in Torr. Bot. Mex. Bound Surv. 212. 1859; *Lophotocarpus*

[1] Elliott, Stephen, op. cit. **1:** 265.
[2] Rhodora **38:** 318 and 350. 1936.
[3] Rhodora **38:** 292. 1936.

fluitans (Engelm.) J. G. Smith, Rep. Mo. Bot. Gard. **11**: 145, pl. 53. 1900.

The submerged aquatic state of this species with narrower leaves and slender scapes and petioles can be considered but an ecological phase of the normal type. Plants referred to this form grew in deeper water (about 2 feet deep) than the ordinary type which occurred nearer shore and in shallower water.—Missouri: in Coldwater creek, at Nations Mill, above dam, 3 mi. northeast of Womack, T. 35 N. R 8 E, sect. 27, Ste. Genevieve Co., Aug. 21, 1936, *Steyermark 21097*.

Camassia scilloides (Raf.) Cory, forma **Petersenii** Steyermark, f. nov., a forma typica recedit foliis 15–40 mm. latis.—Missouri: limestone slopes, Osage Hills, St. Louis Co., April 29, 1936, *Petersen;* same locality, April 23, 1937, *Steyermark 22499*, type in Mo. Bot. Gard. herb.

Many plants belonging to this form were found on open south-facing limestone slopes in this locality. Many plants of the ordinary type were growing with the form. Besides the much broader leaves, this new form has somewhat stouter and more rounded bulbs 2–5 cm. in diameter, stouter and somewhat more densely flowered racemes, the stout scape measuring as thick as 1.0 centimeter. However, while some of the plants referred to this form appear distinct in the extreme, too many transitional specimens occur to warrant treating this as any more than a mere robust broader-leaved phase of the species.

Thalictum dasycarpum Fisch. & Lall., forma **hypoglaucum** (Rydberg) Steyermark, comb. nov. *Thalictrum hypoglaucum* Rydberg, Brittonia **1**: 88. 1931.

Rydberg separates his *Thalictrum hypoglaucum* from *T. dasycarpum* by the combination chiefly of smaller flowers and leaves glabrous and paler on the lower surface. There is sufficient variation, however, in the floral dimensions of the two species to cause too much intergradation between the species. After sorting out the differences between them, the glabrity of the under surface of the leaves is all that remains to distinguish *T. hypoglaucum* from *T. dasycarpum*. This glabrous condition appears rather frequently in plants growing with the ordinary finely pubescent-leaved type, and with no particular geographical range to characterize it, it is here considered a mere form of the species.—Missouri: low banks along North Fork of White river, near Rainbow (Double) Spring, 4 mi. northeast of Dormis, Ozark Co., May 16, 1936, *Steyermark 10449;* low woods along fork of Wyaconda river, between Arbela and Azen, Scotland Co., May 20, 1936, *Steyermark 10786*.

APIOS AMERICANA Medic., forma **pilosa** Steyermark, f. nov., a forma typica recedit caulibus foliisque pilosis.—MISSOURI: banks of Mud creek, T 26 N, R 7 E, sect. 20, 2 mi. northwest of Rombauer, Wappapello Purchase Unit, Clark National Forest, Butler Co., July 7, 1936, *Steyermark 11390*, TYPE in Mo. Bot. Gard. herb; along Little Paddy creek, 5 mi. southwest of Slabtown, Texas Co., Gardner National forest, Aug. 25, 1937, *Steyermark 25316*.

This form, with hairs spreading on stems and scattered over the leaf surfaces, is of infrequent occurrence in Missouri, occurring with the normally glabrous or glabrate type.

IMPATIENS PALLIDA Nutt., forma **dichroma** Steyermark, f. nov., a forma typica recedit petalis superioribus lateralibusque albis et sepalo posteriore luteo.—MISSOURI: wooded base of bluffs along Mississippi river, 1½ mi. northwest of Louisiana, T 54 N, R 2 W, sect. 11, Pike Co., Sept. 6, 1937, *Steyermark 25927*, TYPE in Mo. Bot. Gard. herb.

Two other color variants of the normally yellow-flowered *Impatiens pallida* have already been described, one in 1904 by Clute, *I. pallida* var. *alba* with pure white flowers (Am. Bot. **7**: 67. 1904), and the other in 1920 by Jennings, *I. pallida* f. *speciosa* with cream-colored flowers which have the ventral inner surface of the saccate sepal dotted with red (Ohio Journ. Sci. **20**: 204. 1920). The form here described is two-colored, the upper and lateral petals being white, while the posterior saccate sepal is yellow.

RUDBECKIA HIRTA L., forma **homochroma** Steyermark, f. nov., a forma typica recedit disci floribus luteis.—MISSOURI: upland woods, 10 mi. west of New Liberty, Fristoe Purchase Unit, Clark National Forest, Oregon Co., July 3, 1936, *Steyermark 11345*, TYPE in Mo. Bot. Gard. herb.

Numerous color variations of this species have already been described. The above described form, however, with the disk- as well as the ray-florets yellow throughout, has not been recorded. This form was found with the normally bi-colored type.

FIELD MUSEUM OF NATURAL HISTORY,
Chicago, Illinois

A FLORA OF OKLAHOMA.—There has recently appeared a rather sumptuous, well printed and neatly illustrated book of more than 700 pages and nearly 500 text-figures upon the Oklahoma Flora.[1] As the first extensive

[1] OKLAHOMA FLORA (Illustrated) by THOMAS R. STEMEN and W. STANLEY MYERS. Harlow Publishing Corp., Oklahoma City, Okla. $6.00.

volume professing to cover the flora of the state it is noteworthy; but, although one can heartily praise the good intent which lay back of its production and the excellent work of the publishers, it is more difficult, after even a casual examination, for an experienced taxonomist to give unqualified praise to the taxonomic content. The book restricts itself to the more conspicuous groups and does not include the extensive and important but difficult grasses, sedges and rushes. It thus stamps itself as a "popular" rather than a scientific work, but since it is intended for "students of . . . botany" it is desirable to consider it from the standpoint of that science.

"The American Code of Nomenclature has been followed, and synonyms from the International Code are given where different." Several years ago the American Code was gasping its last lingering breath among the leading botanists, though something related to it but not always recognizable has been followed by Small alone among outstanding American taxonomists. The new book, then, is often a close follower of Small, rather than of the American Code, but it frequently departs from him. In generic and specific segregation it is divided between the extreme Smallian splitting and the most conservative standpoint. In holding *Juniperus*, *Smilax*, *Arenaria*, *Acer*, *Vitis* and certain other genera intact the authors show highly commendable conservatism; but in maintaining *Ionoxalis* Small and *Xanthoxalis* Small and the segregates of *Euphorbia*, *Rhus* and *Oenothera* they are on less secure ground. What would happen to *Oxalis* if the extreme splitter got outside the north temperate zone? He would very soon discover leafy-stemmed plants with violet petals, bulbous and acaulescent plants with yellow petals and endless other combinations of characters until he would be sore pressed to invent enough "micronyms."

Turning to the botanical content of the book, a botanist cognizant of current literature, even though he has never been in Oklahoma, is at once struck by the great number of species and genera he chances to know about which are not mentioned. There is no indication in the Preface that the authors consulted or even knew about the extensive collections accumulated at the State University and outside, and they too evidently are unfamiliar with important current taxonomic, floristic and monographic literature. Even the pages of geographically remote Rhodora, which is available at the State University if not elsewhere in Oklahoma, contain special articles recording for the state *Calopogon pulchellus*, *Glottidium vesicarium*, *Phacelia congesta* and *Hedeoma camporum*, but these species and the first two genera did not get into the new book. Other standard literature supplies very many additional specific or even generic additions. Only a few out of the many will here be noted, merely to indicate the literature which should be consulted before undertaking a state flora. As far back as 1900 Coulter & Rose, in their *Monograph of the North American Umbelliferae*, gave citations of Oklahoma specimens in 3 genera which the authors of the new book do not include: *Apiastrum*, *Polytaenia* and *Lomatium*. Coming down to a few more current monographs, Anderson & Woodson's *Species of Tradescantia Indigenous to the United States* (1935) cites from Oklahoma 3 species, *T. ozarkana*, *T. Ernestiana* and *T. Tharpii*, none of them in the later volume. By skimming Rydberg's treatment of the *Astragalinae* in the North American Flora (1929) 3 additional species of *Astragalus*, *A. cyaneus*, *A. Engelmanni*

and *A. puniceus*, could have been picked up. Steyermark's monograph of *Grindelia* (1934) cites a third Oklahoma species; and Pennell's *Scrophulariaceae* of *Eastern Temperate North America* (1935) adds at least 12 more Oklahoma species. Pennell gives detailed maps as well as citations of specimens of each species, consequently these overlooked Oklahoma species can be readily looked up; but it was a pity to miss *Penstemon oklahomensis!*

The failure to study the recent critical, taxonomic literature has not merely led to the overlooking of probably hundreds of conspicuous Oklahoma species; it has led to the inclusion of many which, presumably, are not actually in the state; such, to cite a few cases, as *Cuthbertia graminea*, *Talinum teretifolium* and *Lobelia elongata*. As to the first of these, *Cuthbertia graminea* Small, its own author, in his *Manual*, restricts it to "Fla. to N. C.;" Anderson & Woodson, reducing it to varietal rank under *Tradescantia rosea*, similarly restrict its range. As early as 1900 Holzinger (Asa Gray Bull. viii. 38) showed that no material from west of the Mississippi is referable to *Talinum teretifolium*. The same conclusion was reached by Fassett in his study of the genus (RHODORA, XXX. 206). By McVaugh, who saw the material of the genus in most of our larger herbaria, *Lobelia elongata* is restricted to the outer coastal plain from Georgia to Delaware (RHODORA, XXXVIII. 286).

Other studies of the types and the consequent changes involved have failed to influence the authors of the new book. In numbers of RHODORA, at one time or another, I have shown, for example, that the type of *Galium tinctorium* L. (1753) is not the plant to which that name has been erroneously applied but is the small and scabrous northern *G. Claytoni* Michx. (1803); that the type of *Geum virginianum* L. is the plant described more than a century later as *G. flavum* (Porter) Bicknell; that *Draba caroliniana* and *Ranunculus delphinifolius* must take earlier specific names. Dr. Perry, similarly, has shown that the name *Evolvulus pilosus* Nutt. is invalid and that it must be replaced by another. In 1905 (Torreya, v. 128) Harper clearly demonstrated that the interpretations of *Xyris flexuosa* and *X. torta* have suffered tortion or been twisted, and that the stout plant of pine barren with many twining bulbs, large spikes and fimbriate sepals (*X. torta* of many treatments, *X. arenicola* Small) is true *X. flexuosa*. The slender bog-plant with small spikes and merely ciliate sepals, which has erroneously passed as *X. flexuosa*, proves to be true *X. torta*. The plants are correctly treated in Small's *Manual*, yet the authors of the Oklahoma Flora have failed to make the change; their plant is *X. torta*, not *X. flexuosa*. This reversing of the application of names has confused others and doubtless will continue to do so. In an extended illustrated monograph of the group I attempted to clarify the identities of *Potamogeton diversifolius* and *P. dimorphus* (at the same time citing from Oklahoma material of *P. panormitanus*, which failed to get into the new book). These and very many other recent studies based upon accurate examination of the type-specimens would greatly alter many interpretations in the *Oklahoma Flora*. It is too bad that its authors did not know about them or take them into account.

In short, the details of exact taxonomy, nomenclature, synonymy and bibliography have been too much for the authors. For example; the late distinguished Sereno Watson appears (p. 170) as "S. Watts" and *Verbena Halei* becomes V. "*Haleii*." It is perfectly well known to all who have

kept up with the current authoritative literature on our flora that the plant published as *Scrophularia leporella* Bicknell (1896) was described 82 years earlier as *S. lanceolata* Pursh (1814); consequently Pursh's name is now generally revived. Similarly, that *Verbena angustifolia* Michx. (1803) is antedated by the quite different *V. angustifolia* Mill. (1768) with the result that Michaux's name must be replaced by the first later one, *V. simplex* Lehm. (1825). Nevertheless, in the new book *Scrophularia leporella* and *Verbena angustifolia* are maintained and the proper names, *S. lanceolata* and *V. simplex*, respectively, reduced to synonymy! And what about *Suaeda americana?* The latter is a depressed plant with remarkably dissimilar sepals and it is known only from the lower St. Lawrence in Quebec to the coast of Maine. It is not mentioned, naturally, in the Southern floras of Small; and in the North American Flora Standley maintains it with the range above given. *S. linearis* is a tall and erect southern species with small and quite uniform sepals. Why, then, does *Suaeda americana* appear in the new book as a synonym of *S.* (or *Dondia*) *linearis?* Do the authors really know *S. americana?* As a synonym of *Lepidium densiflorum* we find *L.* "*apetalum* A. Gray." Where did Gray publish *L. apetalum?* But perhaps as amazing as anything is "**Arenaria Nuttallii** (T. and G.) Stemen and Meyers"; because one of the best known species of *Arenaria* on the Pacific slope is *A. Nuttalli* Pax (1893), the name maintained, correctly, in the *Synoptical Flora* and other works which should be familiar to authors before they are in position to propose new combinations.

The authors are both teachers of science and intend their book to "be of service to students of biology and botany." It is at least cheering to know that in Oklahoma at least botany has not yet got submerged in "biology" and consequently crowded out by zoology or physiology, and it is to be hoped that the book will start active and careful study of the flora. It is feared, however, that the keys have a specious simplicity which may carry the inexperienced off the right track and will often give him distorted morphological concepts. Take, for instance, the key to the families of frondose *Pteridophyta.*

"**A. Plants with creeping rootstocks.**
1a. *Fronds not radiately 4-foliate.*
2a. Sori borne in panicles. **4. OSMUNDACEAE.**
2b. Sori borne on back or margins of fronds or leaflets.
(Onoclea appears to be different.) **1. POLYPODIACEAE.**
1b. *Fronds radiately 4-foliate* **3. MARSILIACEAE.**
B. Plants without creeping rootstocks. 2. OPHIOGLOSSACEAE."

As to call **A,** it will be pretty difficult for the beginners, who collect ferns (most wisely) without digging up the whole plant, to convince themselves whether some of their specimens of *Osmunda, Asplenium, Cheilanthes,* etc. have creeping rootstocks; this is a rather baffling character in case of plants with the short and erect or ascending rhizome deeply buried amongst old stipes. Again, isn't it unfortunate to tell the beginner that the fronds of *Marsilea* are 4-leaved ("4-foliate")? 4-parted or 4-foliolate would be better.

Or consider the first divisions under the caulescent Monocotyledons.

"1a. *Perianth wanting or of bristles.*
2a. Immersed aquatics, branching and leafy, the upper leaves often floating.
3a. Carpels distinct. **1a. ZANNICHELLIACEAE.**
3b. Carpels united. **1b. NAIADACEAE.**
2b. Terrestrial or marsh plants.
Leaves petioled; flowers in dense spikes subtended by an enlarged bract. **3. ARACEAE.**
Leaves not petioled, linear or sword-shaped; flowers in cylindric spikes. **1. TYPHACEAE.**"

Now, if *Najas*, the only genus of the *Najadaceae* as here maintained, is to be reached through the key only because it has "Carpels united," where will the trusting student come out? Rendle, the monographer of the group, defines the female flower as "a naked ovary . . . containing a single anatropous ovule"; Hutchinson says "ovary of 1 carpel, 1-celled." These definitions, needless to say, are correct; but pity the youngster who trys to identify *Najas* by means of a key defining the characteristic family merely by "Carpels united." And how will the beginner ever separate, by the key, *Acorus* of the *Araceae* from *Typha?* It the authors had simply said "Sweet Flag" and "Cat-tail" almost any child would understand, but it requires a person long experienced with errors and knowing what not to believe to differentiate them by the key to families. Try it. *Acorus*, by the key, should have "*Perianth wanting or of bristles;*" nevertheless, the generic description (p. 38) correctly assigns it a "*Perianth* of 6 membranous concave sepals." *Typha* is distinguished by "Leaves not petioled, linear or sword-shaped: flowers in cylindric spikes." Isn't that a reasonable description of the superficial aspect of *Acorus?* There remains for *Acorus* (at least for the *Araceae*) "spikes subtended by an enlarged bract," with nothing said of the conspicuous, though caducous, bracts of *Typha*.

By many in this country, some of whom should know better, the function of a reviewer is to "boost" anything written, to praise the binding (in this case very attractive), the paper, the typography and the pictures (some of high quality) and to applaud the authors. But what of the SCIENCE of taxonomy? If that is important, as I feel it is, then we should certainly demand that the authors of books in that field intended for the service of "students of . . . botany" should be trained and accurate taxonomists (of whom there are very few), with a clear understanding of the vastness, the difficulty, the literature and the technique of the subject. The authors of the present book have the zeal and the love of their subject and their publishers have done a creditable piece of book-making. May the authors eventually give us a work which will more fully meet the exacting requirements of thorough taxonomic and floristic work.—M. L. F.

A NEW SELENIA FROM TEXAS.—SELENIA **grandis** Martin, sp. nov., herba annua glabra; caulis prostratus vel paullo ascendens; folia bipinnatisecta; flores in pedunculis axillaribus elongatis; sepala inaequalia, oblongo-cuneiformia, appendiculata, maxima 15 mm. longa; petala flava, ovato-cuneiformia, ad 22 mm. longa, rotundata vel emarginata; fructus oblongus, 22 mm. longus, breviter stipitatus, vesiculis lunatis; stylus persistens, 4 mm. longus.

Glabrous winter annual; stems prostrate or slightly ascending, as much as 30 cm. long; leaves crowded, bipinnatisect, the ultimate segments rounded, the rachis narrowly winged; flowers on long axillary peduncles; sepals unequal, the largest 15 mm. long, all appendaged; petals yellow, ovate-cuneiform, rounded or notched at the apex, up to 22 mm. long; fruit oblong, rounded at the short-stipitate base and at the apex, beset with cresentic vesicles; style persistent, 4 mm. long.

Type in the United States National Herbarium, No. 1269222, collected by *Robert Runyon* near Harlingen, Cameron County, Texas, March 1926. Also represented by *Runyon* 706 from the same locality.

Selenia grandis differs from the other species of the genus in being a larger plant, having larger flowers, and in the presence of vesicles on the fruit. Its nearest relative is *S. dissecta* Torr.—Robert F. Martin, Division of Plant Exploration and Introduction, Bureau of Plant Industry, Washington.

Datura Stramonium L., var. **inermis** (Juss.) comb. nov. *D. inermis* Juss. ex Jacq. Hort. Vindob. iii. 44, t. 82 (1776).

Datura inermis has presumably been formerly reduced to varietal rank. It is generally considered a variety of *D. Stramonium* but search in the more probable sources has failed to reveal a proper transfer of the name.

It should be noted that Torrey reduced *Datura Tatula* L. to varietal rank in 1824. The bibliography of this variety is as follows.

D. Stramonium L., var. β. Tatula (L.) Torr., Fl. N. Mid. U. S. 232 (1824); Wood, Class-Book, 300 (1845); Dunal in DC. Prodr. xiii.[1] 540 (1852). *D. Tatula* L. Sp. Pl. ed. 2, i. 256 (1762). *D. Stramonium*, var. β. *chalybea* Koch, Syn. Fl. Germ. Helv. 510 (1837). *D. Stramonium*, var. *Tatuloides* Raf. Med. Bot. 148 (1841).—M. L. Fernald.

Volume 40, no. 471, including pages 77–136 and plates 489–491, was issued 5 March, 1938.

MAY 9 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. May, 1938. No. 473.

CONTENTS:

Valerianella in North America. *Sarah C. Dyal* 185

Silene Menziesii and Allies in Western Canada. *A. E. Porsild* . . 212

Notes on Ephedra in Texas. *V. L. Cory* 215

Anaphalis margaritacea again. *M. L. Fernald* 218

Occurrence of Centipeda minima in Wellesley, Massachusetts. *Alice M. Ottley* 219

Vernonia fasciculata, var. corymbosa. *Bernice G. Schubert* 220

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

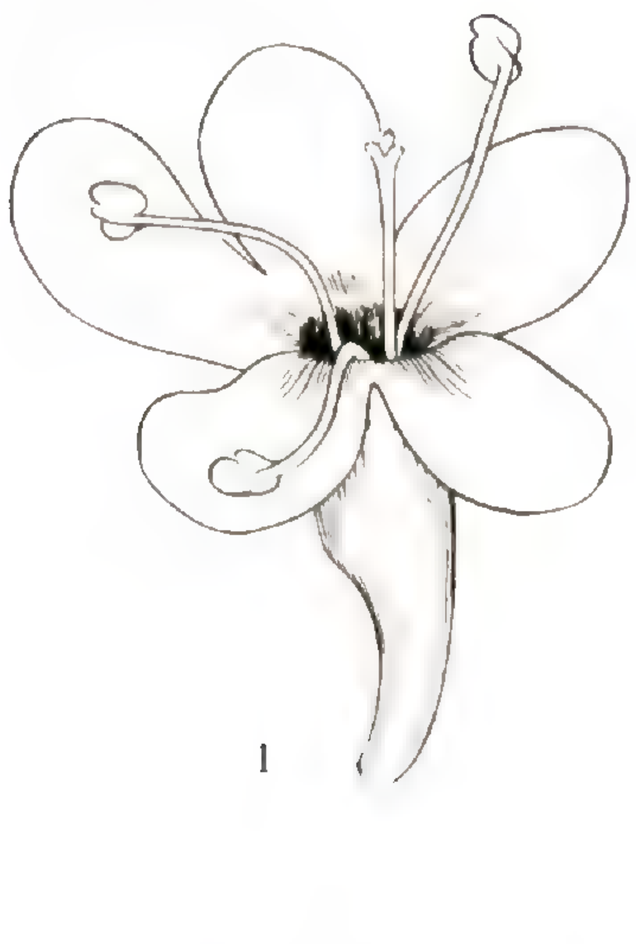
GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

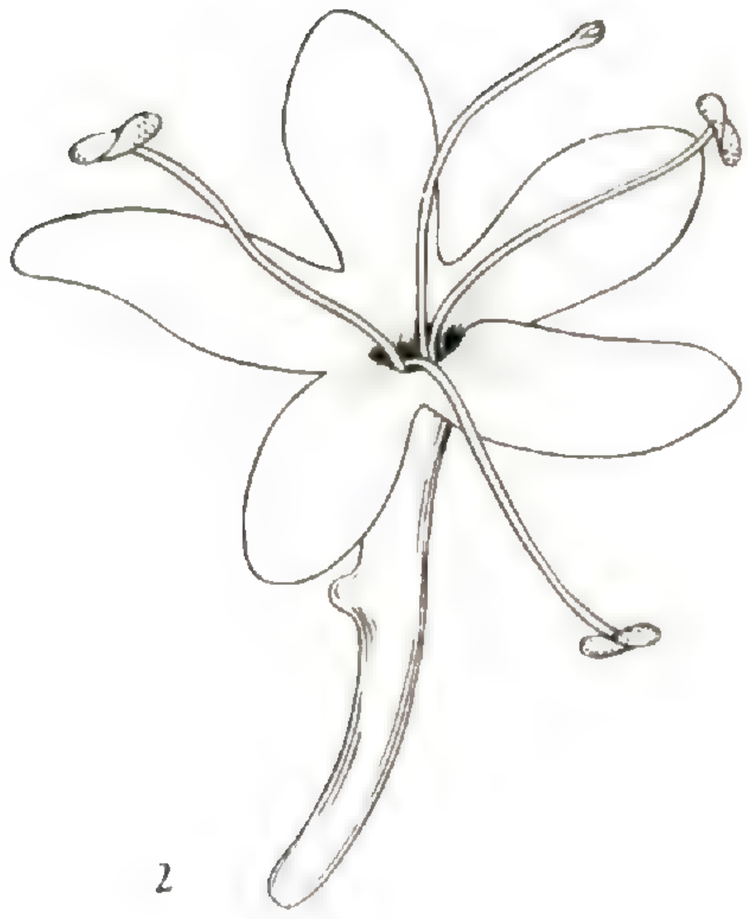
No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

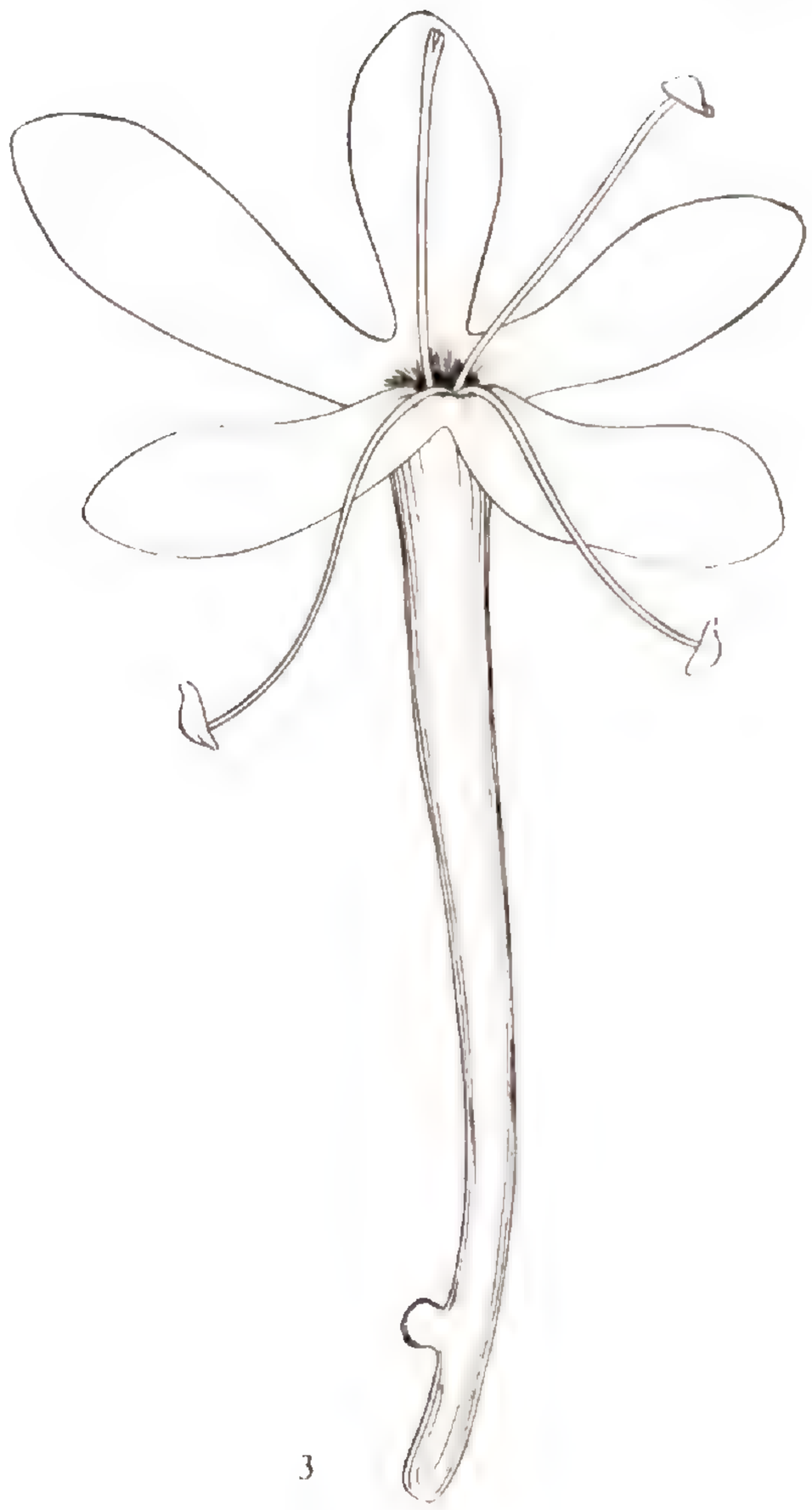
Gray Herbarium of Harvard University, Cambridge, Mass.



1

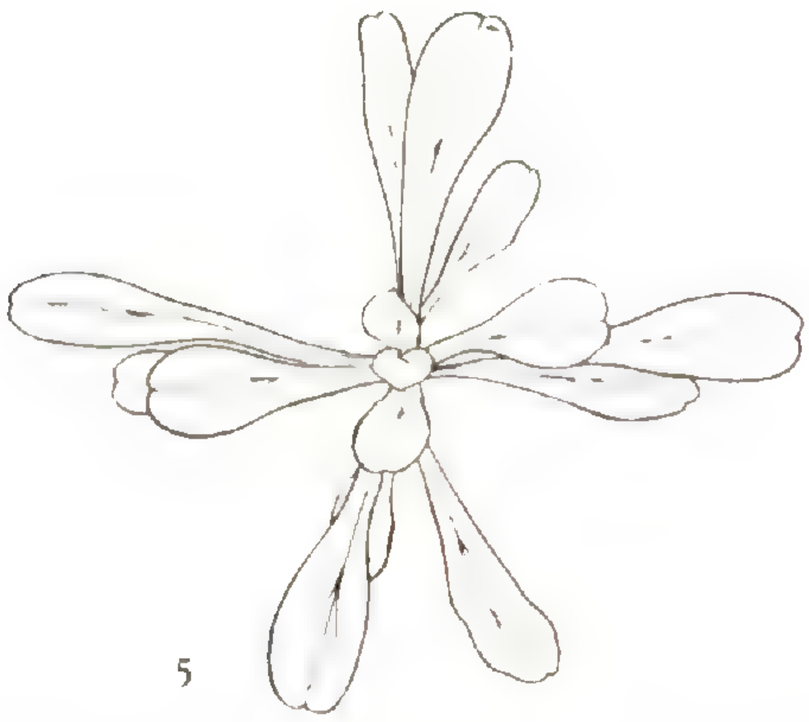


2



3

4



5

6

Corollas, × 8, and Rosettes of Valerianella

Fig. 1, V. amarella; fig. 2, V. Nuttallii; fig. 3, V. ozarkana; fig. 4, V. radiata, var. Fernaldii; fig. 5, V. radiata; fig. 6, V. intermedia.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **May, 1938.** **No. 473.**

VALERIANELLA IN NORTH AMERICA[1]

SARAH C. DYAL

(Plates 492–494)

A recent attempt by the writer to reidentify the material of this perplexing genus in the Cornell Herbarium has seemed to show that other forms exist in North America than those ordinarily recognized. A detailed study of the material in this and other herbaria has resulted in the present paper.

It has long been recognized that the most important diagnostic characters between the species in this genus are furnished by the fruit. Indeed the foliage, and in some cases the flowers also, are so nearly alike in the various species that only a specialist can hope to distinguish them by this means alone. A reexamination of the various possible characters with regard to their taxonomic worth constituted the first step in the present study.

The fruits were found to vary in size from 1.5 to 4 mm. in length and to be composed of three cells, the dorsal one fertile with a vertical outline ranging from narrowly elliptic to broadly ovate; the two ventral ones sterile, appearing as two almost parallel tubes, or in other cases these widely divergent and inflated. The groove formed between these sterile cells, the relative size and shape of these as compared with the fertile cell, and the shape of the fertile cell itself are perhaps the most important fruit characters. In one group of species including *V. amarella*, *V. ozarkana*, and *V. texana*, the kind, size and arrangement of the hairs on the fruit was also found to be important.

[1] The cost of plates and extra pages met by the author.—EDS.

Next to the fruits, the flowers are of importance. The species having salver-form corollas and those with funnel-form corollas have long been recognized as forming two distinct sections called *Siphonella* and *Valerianella* proper, respectively. Within the *Siphonella* section the length of the corolla tube and the location of the callous gibbosity on it have been cited as separating some of the species, but no special attention has been given the group with funnel-form corolla other than to note a variation in color. A critical study of this section, however, shows that the species can be divided into two groups, one with the corollas short and extending only slightly above the bracts in the inflorescence and another with corollas larger extending distinctly above the bracts and hence very conspicuous.

A third character of some importance tending to support the separation of the genus into two sections as based on the corolla is that found in the bracts. In the Siphonella section these are strongly glandularly fimbriate-serrulate while in the true Valerianellas they are either entire and glabrous, or ciliate on the margins, or, only occasionally and slightly, glandularly fimbriate-serrulate. The rounded, pointed, or acuminate tip of the bracts also is important as separating certain species, but without reference to sectional lines.

The pubescence of the plant may be of diagnostic value in certain cases as for instance in separating *V. chenopodifolia* and *V. amarella* from the other species.

The stature of the plant as well as the size and shape of the leaves, though highly variable, are of little taxonomic importance. The variations seem to be chiefly ecological and individual and are largely matters of degree. In general the foliage is remarkably similar in the various species.

The soil requirements of the Valerianellas have not been thoroughly studied. Field and greenhouse study tend to indicate, however, that certain species, as *V. amarella*, *V. Bushii*, *V. ozarkana*, *V. chenopodifolia* and *V. intermedia*, are definitely calciphile. The first three of these species were collected only in habitats where limestone was abundant. The other two have not been collected by the writer but the habitats given on the labels indicate that they are also from calcareous districts. All of these species when grown under greenhouse conditions without any increase in the calcium content of the soil showed a marked abnormality in growth. Other species, as *V. longiflora*, *V. Nuttallii*, *V. radiata* and its varieties, *V. stenocarpa* var.

parviflora, and *V. Woodsiana*, known to grow in non-calcareous districts, gave normal growth under the same greenhouse conditions. All of the various species seem to grow more abundantly in moist habitats. They may inhabit forests, thickety brook banks, or even occur in open fields or along roadsides and on barrens. If *V. radiata* and *V. olitoria* (an introduced species) are excepted, the remaining species fall into two geographic groups, separated by the Mississippi River.

The genus seems to have been first recognized as distinct from *Valeriana* by Tournefort[1] in 1742, who gave it the name *Valerianella*. The first to recognize *Valerianella* in post-Linnean times was apparently Miller[2] in 1754. The name *Fedia* was first proposed by Gaertner[3] in 1791 to displace *Valerianella*. In 1830 DeCandolle[4] segregated the group into three genera, *Fedia* proper, *Valerianella* and *Plectritis*. Woods[5] in 1837 proposed a union of *Fedia* with *Valerianella* but under the name *Fedia*, his objection to the name *Valerianella* being that it is a diminutive in form. Torrey and Gray[6] in 1841, perhaps following Woods in this respect, treated *Fedia* and *Valerianella* together under *Fedia* but recognized *Plectritis* as distinct. This procedure was followed in the first five editions of Gray's Manual and in Wood's botanies. Gray[7] in 1883, and again in the Synoptical Flora in 1884, united all three genera but under the name *Valerianella* as the oldest name and the one connected with the largest number of species. Höck[8] in 1891 again treated the three genera as distinct but transferred the section *Siphonella* of *Valerianella* to *Plectritis*. Since that time American authors have variously treated the two groups occurring in this country, *Valerianella* and *Plectritis*, as one genus or as two. While, as Dr. Gray states, most of the distinguishing characters cited by various writers break down, yet the group *Plectritis* seems to be a reasonable entity, as good as *Fedia* if not better. Following the practice of several more recent authors the writer is treating the two genera as distinct.

The first really critical study of the North American species of

[1] Tourn. ex Hall. Enum. Stirp. Helv. 666 (1742).
[2] Miller, Gard. Dict. Abr. Ed. 4 (1754).
[3] Gaertner, Fruct. et Sem. **2**: 36, t. 86, f. 3 (1791) partim.
[4] DeCandolle, Prod. **4**: 629 ff. (1830).
[5] Woods, Trans. Linn. Soc. **17**: pt. 3, 421–433 (1837).
[6] T. & G., Fl. N. Am. **2**: 50–53 (1841).
[7] Gray, Proc. Amer. Acad. **19**: 81–83 (1883).
[8] Höck, Engler & Prantl, Nat. Pflanzenfamilien **4**[4]: 172–178 (1897).

Valerianella was that of Torrey and Gray,[1] who in 1841, described four new species and a new variety.

In 1864, Krok,[2] a Swedish botanist, published a very critical monograph of the Valerianellas of the world. Included were four plates of drawings of the fruits of all of the species known at that time.

In 1872, appeared a paper by Thos. C. Porter,[3] on "The Fedias of the Northern United States." In this the illustrations of the fruits were especially valuable. No new species were proposed but *Fedia patellaria* and *Fedia umbilicata* were reduced to varietal rank under *F. radiata*.

The last comprehensive revision of the genus in North America was by Dr. Gray[4] in 1883, repeated in the Synoptical Flora in 1884.

The general practice of the European students of Valerianella in subdividing the genus into sections should be considered briefly. Krok gave a good summary of the different subdivisions recognized by the earlier botanists, giving also his own, which is composed of older sections that he believed suitable and some new ones which he proposed. His treatment included all of the recognized North American species and is therefore important here. However, the discovery noted in the present paper of two new species in the long-flowered section *Siphonella* is disconcerting since suborbicular fruit is one of the important characters of this section and both of these new species have oblong fruits. Neither does the character of glandularly fimbriate-serrulate bracts hold as a distinguishing mark of this section as stated by Krok. This character is very prominent in the *Siphonella* section but it also occurs to a much less degree in *V. stenocarpa*, *V. radiata* and *V. Woodsiana* which are in the *Platycoelae* section of Krok. Also in one of the young plants of *V. Bushii*, which belongs to the group with prominent glandularly fimbriate-serrulate bracts, most of the bracts are ciliate. The only character left to separate *Siphonella* and *Platycoelae* is the type of corolla. Therefore Small's practice of considering *Siphonella* a genus seems scarcely warranted.

As a result of the present critical examination of literature and specimens, five new species and three new varieties have been recognized by the writer. It is hoped that the key here submitted will make identification less difficult than before. A considerable magni-

[1] Torrey & Gray, Fl. N. Am. **2**: 50–53 (1841).
[2] Krok, Kongl. Svensk. Akad. Handl. **5**: 1–105, 4 pl. (1864).
[3] Porter, Am. Naturalist **6**: 385–388 (1872).
[4] Gray, Proc. Am. Acad. **19**: 81–83 (1883).

fication has been found helpful, however, in working out the fruit characters.

The material forming the basis of this study is that in the herbarium of Cornell University, the Bailey Hortorium, the Gray Herbarium, the New York Botanical Garden, the Missouri Botanical Garden, the University of Arkansas, the University of Oklahoma and type specimens in the European herbaria. Altogether about 1,000 specimens have been examined.

The need for a revision of the genus *Valerianella* in North America was suggested to the writer by Dr. K. M. Wiegand of Cornell University, under whose supervision the work has been carried on and completed. To him the writer wishes to express appreciation for his encouragement, helpful suggestions and advice and to the curators of various herbaria for the loan of specimens which made the completion of the problem possible. The writer is also indebted to Dr. L. H. Bailey, whose assistance made the study of types in foreign herbaria a pleasure, and to Miss Velma Knox of Cornell University for the drawings.

A. Corolla funnel-form, or more open, usually with a short proper tube equalling the limb or shorter, the throat with a small saccate gibbosity at its base on the ventral side.
  B. Fruits with a corky mass on the dorsal side of the fertile cell ..... 1. *V. olitoria*
  B. Fruits without the corky mass.
    C. Fertile cell of fruit about one-third to one-half the combined width of the sterile cells.
      D. Corolla 1.5–2 mm. long, inconspicuous above the bracts; fertile cell of fruit ellipsoid ..... 2. *V. Woodsiana*
      D. Corolla 3–5 mm. long, conspicuous above the bracts; fertile cell of fruit ovate.
        E. Fruit 3.25 mm. long by 3 mm. wide, flattened dorsiventrally ..... 3. *V. patellaria*
        E. Fruit 2–2.5 mm. long by 2 mm. wide, globular with a pit-like depression on the ventral surface between the sterile cells ..... 4. *V. umbilicata*
    C. Fertile cell of fruit about equalling or wider than the combined width of the sterile cells.
      F. Plants glabrous except for tufts of hairs on each side of the leaf-base near the nodes.
        G. Fruit glabrous or finely pubescent, 3–4 mm. long; corymb loose, glomerate cymules few ..... 5. *V. chenopodifolia*
        G. Fruit white-hirsute, 1.5–2 mm. long, hairs uncinate; corymb compact, glomerate cymules many ..... 6. *V. amarella*
      F. Plants pubescent, sometimes only on the leaves and on the lower part of the stem, in addition to tufts on each side of leaf-base near the nodes.
        H. Fruits laterally compressed, strongly carinate.
          I. Corolla completely white, 2 mm. long, conspicuous above the bracts; hairs on the fruit capitate, arranged in lines on the fertile and sterile cells ... 7. *V. texana*

I. Corolla white with purplish-blue lobes, 1.5 mm. long, inconspicuous above the bracts; hairs on fruit, when present, pointed, not arranged in lines.....8. *V. carinata*

H. Fruits dorsiventrally compressed, never strongly carinate.

J. Fruits ellipsoid; fertile cell rounded on the dorsal side.

K. Corolla 2.5–3.5 mm. long, conspicuous above the bracts.....9. *V. stenocarpa*

K. Corolla 1.5 mm. long, inconspicuous above the bracts.....10. *V. stenocarpa*, var. *parviflora*

J. Fruits ovoid; fertile cell flattened on the dorsal side.

L. Corolla 3–5 mm. long, conspicuous above the bracts.

M. Fruits slightly more than twice as long as wide, sterile cells abortive.....11. *V. Palmeri*

M. Fruits less than twice as long as wide, sterile cells about as thick as the fertile.....12. *V. intermedia*

L. Corolla 1.5–2 mm. long, inconspicuous above the bracts

N. Sterile cells of fruit more or less divergent with a prominent groove between them, their combined width slightly less than or wider than the fertile

O. Fertile cell equalling or wider than the combined width of the sterile cells.....13. *V. radiata*

O. Fertile cell slightly less than the combined width of the sterile cells

14. *V. radiata*, var. *missouriensis*

N. Sterile cells more approximate with only a slight groove between them, their combined width about half the width of the fertile.....15. *V. radiata*, var. *Fernaldii*

A. Corolla salver-form, the tube double or quadruple the length of the limb, with a small callous gibbosity on the ventral side.

P. Corolla-tube 4–5 mm. long with the gibbosity near or above the middle.....16. *V. Nuttallii*

P. Corolla-tube 7–9 mm. long with the gibbosity near the base.

Q. Fruit laterally compressed with three distinct lines of long hairs, one down the dorsal side of the fertile cell and one down each of the sterile cells.....17. *V. ozarkana*

Q. Fruits flattened dorsiventrally, glabrous or finely pubescent without any distinct lines.

R. Fruit oblong, fertile cell larger than the sterile cells, groove between the latter narrow.....18. *V. Bushii*

R. Fruit nearly orbicular in ventral view; fertile cell much narrower than the sterile cells, groove between the latter wide.....19. *V. longiflora*

1. Valerianella olitoria (L.) Dufr. *Valeriana Locusta α olitoria* Linn., Sp. Pl. 33 (1753). *Valerianella olitoria* Poll., Hist. Pl. Palat. **1**: 30 (1776): Krok, Kongl. Svensk. Akad. Handl. **5**: 88 (1864); Dudley, The Cayuga Flora, Bull. Cornell Univ. **2**, pt. 1: 45; Gray, Syn. Fl. N. Am. **1**, pt. 2: 44; Chapman, Fl. S. U. S. ed. 3: 202. *Valerianella Locusta* Betcke, Anim. Val. 10 (1826); Robinson & Fernald, Gray's

Man. ed. 7, 762; Britton & Brown, Ill. Fl. **3**: 245 & ed. 2, **3**: 286; Small, Fl. Se. U. S., ed. 1 & 2, 1128; House, Ferns and Flowering Plants of New York State, 656; Wiegand & Eames, Fl. of Cayuga Lake Basin, 391; Small, Man. Se. Fl., 1278; Muenscher, Weeds, 438. *Fedia olitoria* Vahl, Enum, **1**: 19 (1804); T. & G. Fl. N. Am. **2**: 51.—Stem 1–2.5 dm. high, pubescent: leaves hairy on the margin, upper surface, and along the midrib on the lower surface; the lower spatulate, connate, entire; the upper oblong-ovate, sessile with a few teeth on each side near the base: bracts ciliate; the inner narrow and blunt; the outer broad and rounded at apex: inflorescence loose, open, and corymbosely cymose: corolla white, often with bluish limbs, funnel-form, 1.5 mm. long; throat extending almost to the base; tube very short with a saccate gibbosity at the base of the throat on the ventral side: stamens and style not much exserted: stigma-lobes short: fruit yellowish, 2–4 mm. long (usually 2 mm.), laterally compressed, glabrous or finely pubescent, with a thick corky mass on the dorsal side of the fertile cell; sterile cells narrow with a very narrow shallow groove between them; cross section of fruit elliptic.—Moist waste places, eastern United States, Utah, Idaho, Oregon, and California. Introduced from Europe. Among 75 specimens examined were the following: NEW YORK: Frontenac Island, Cayuga Lake, June 7, 1884, *Dudley*, no 70; pasture south side of hill road north of Coy Glen, Ithaca, May 18, 1919, *A. H. Wright*, no. 12956. NEW JERSEY: bank of canal feeder, Trenton, *R. C. Perry*. PENNSYLVANIA: along west bank of Tacoma Creek, Crescentville, Philadelphia, May 9, 1899, *MacElwee;* Conestoga Creek, *A. F. Eby;* damp grassy bank of Beaver Creek, 1¼ miles northeast of Ottville, June 4, 1933, *F. J. Hermann*, no. 4284; border of moist woods near Schuylkill River, Linfield, May 1, 1915, *Long*, no. 11662; Lancaster, May 18, 1861, *C. F. Parker*, no. 2864; Park, Robinson's Knoll, Philadelphia, May 24, 1872, *Redfield*, no. 2863. DISTRICT OF COLUMBIA: Avalon Heights, May 15, 1892, *Ferdinand Blanchard;* brushy alluvial flat, above Cabin John, May 7, 1906, *Maxon*, no. 6151. VIRGINIA: grassy roadside in town, Williamsburg, *Grimes*, no. 3451; dry bank, Hunting Creek, May 3, 1905, *Painter*, no. 1242. NORTH CAROLINA: Chapel Hill, April 1891, *F. B. Maxwell*. INDIANA: Clifty, Hanover, May 19, 1893. TENNESSEE: water tank on K. & C. R. R., Knoxville, May 9, 1899, *Ruth*, no. 80; waste grounds, Knox Co., June 1898, *Ruth*, no. 612. IDAHO: collected about Lewiston, May 18, 1896, *A. A.* & *E. Gertrude Heller*, no. 3085; grassy meadows, Valley of Clearwater River, Lewiston, May 13, 1892, *Sandberg*, no. 157. OREGON: Imnaho, Wallowa Co., June 5, 1923, *Wm. Sherwood*, no. 457. CALIFORNIA: Siskiyou Co., *Geo. D. Butler*, no. 729.

The writer examined the type of this species in the Linnean Herbarium, which is labeled, "*Locusta olitoria*" in Linnaeus' own handwriting. Most of the manuals and floras in the United States recognize the name *V. Locusta* for this species while the majority in

Europe recognize *V. olitoria*. Since there is no type in the Linnean Herbarium for *Locusta* it may be supposed that Linnaeus used that name as a binding word for his varieties. And so, following that assumption and the practice of those in charge at Kew Gardens and at the Linnean Herbarium, the alpha variety when raised to specific rank would become *V. olitoria*.

V. olitoria differs from all other North American species of *Valerianella* in its peculiar fruit with a corky mass on the dorsal side of the fertile cell. The only other species which approaches it in this respect is *V. ozarkana* which has a keel-like projection on the dorsal side of the fertile cell that seems to be a corky mass. However, the cells forming this projection are smaller than those of the corky mass in *V. olitoria*. There are three European species having a similar corky mass, *V. capitata*, *V. costata*, and *V. gibbosa*. These are all closely related to *V. olitoria*.

2. V. WOODSIANA (T. & G.) Walp. *Fedia Woodsiana* T. & G., Fl. N. Am. **2**: 52 (1841). *V. Woodsiana* Walp., Rep. **2**: 527 (1843); Gray, Syn. Fl. N. Am. **1**, pt. 2: 45; J. M. Coulter, Fl. W. Texas, 348; Britton & Brown, Ill. Fl. **3**: 247 & ed. 2, **3**: 288; Robinson & Fernald, Gray's Man. ed. 7, 763; Small, Fl. Se. U. S. ed. 1 & 2, 1129.—Stem 1.5–5 dm. high, rather stout, pubescent along the angles: leaves hairy on the margin and on the midrib on the lower surface; the lower spatulate, entire, slightly connate; the upper oblong-ovate with several coarse teeth near the base, not connate: bracts glabrous, usually weakly glandularly fimbriate-serrulate toward the tip: inflorescence loose to more compact, corymbosely cymose: corolla white, 1.5 mm. long, funnel-form; tube much shorter than the limb; a saccate gibbosity at base of throat on the ventral side; stamens and style exserted: stigma-lobes short: fruit yellowish, sub-globose, glabrous or finely pubescent; fertile cell often short-beaked, narrowly oblong, weakly one-nerved and flattened on the dorsal side, much narrower than the inflated widely divergent sterile cells which have a wide groove between them.—Moist low grounds in woods and on the prairies of eastern Oklahoma and Texas. OKLAHOMA: near Tecumseh, June 1, 1932, *Elizabeth D. Barkley*, no. 108; sandy river bottom, 35 miles south of Norman, April 17, 1927, *R. E. Chase*, no. 37; hillsides west of Bristow, May 18, 1930, *Ora M. Clark*, no. 2582; low moist soil and dry uplands, near Norman, April 23, 1917, *R. E. Jeffs*, no. 67; one-fourth mile south of Norman, along small stream in shade, May 3, 1926, *Elbert L. Little*, no. 96; Muskogee Co., Sec. 22, T. 14 N., R. 18 E., April 23, 1927, *Little*, no. 1763; low ground southeast of Norman, *Mabel Nielsen*, no. 43; R. R. Track east of university, in moist soil, April 29, 1924, *J. A. Rieger*, no. 63. TEXAS: "common on prairies," Columbia, April 9, 1899, *Bush*, no. 85 and April 24, 1900,

no. 144; "common in woods," Columbia, April 3, 1902, *Bush*, no. 1301; near Marshall, April 20, 1901, *Canby*, no. 140; prairies, Bryan, Brazos Co., April 30, 1917, *E. J. Palmer*, no. 11726; "common in woods," Dallas, April 18, 1901, *Reverchon*, no. 2605; on barren sterile land, Tarrant Co., May 1, 1921, *Ruth*, no. 52 (in part); Rio Brassos, January, 1835, *Drummond*, no. 70 (?) (probably specimen cited in original description).

This species was based by Torrey and Gray on material collected in Texas by Berlandier and Drummond. The writer has not seen the Berlandier specimen but in the Gray Herbarium is a specimen bearing the inscription "Rio Brassos, Texas, *T. Drummond*" and named *V. Woodsiana* by Gray. This is doubtless to be considered type material.

The range of *V. Woodsiana* as here stated is eastern Oklahoma and Texas, the type coming from Texas. Most of the recent manuals give the range as from New York to Texas but in these treatments *V. patellaria* and *V. umbilicata* are regarded as varieties of *V. Woodsiana*.

V. Woodsiana closely resembles *V. radiata* in general aspect but the fertile cell of the fruit is narrowly oblong as opposed to the relatively broad ovate one of the latter species, and the fruits are generally glabrous instead of pubescent as in most specimens of *V. radiata*.

3. V. PATELLARIA (Sulliv.) Wood. *Fedia patellaria* Sulliv., A. Gray, Man. 183 (1848). *V. patellaria* Wood, Class Book, 405 (1861); Krok, Kongl. Svensk. Akad. Handl. **5**: 67 (1864); Small, Fl. Se. U. S. ed. 1 & 2, 1129; Small, Man. Se. Fl. 1728. *V. radiata*, var. *patellaria* Porter, Am. Nat. **6**: 386 (1872). *V. Woodsiana*, var. *patellaria* A. Gray, Proc. Am. Acad. **19**: 82 (1883); Gray, Syn. Fl. N. Am. **1**, pt. 2: 45; Britton & Brown, Ill. Fl. **3**: 247 & ed. 2, **3**: 288; Robinson & Fernald, Gray's Man, ed. 7, 763.—Stems 3–6 dm. high, pubescent on the angles, rather stout: leaves sparingly hairy along the margin and on the midrib on the lower surface; the lower spatulate, connate, entire; the upper oblong-ovate with a few coarse teeth near the base, not connate: bracts usually glabrous, lanceolate, the midrib slightly excurrent: inflorescence loose, corymbosely cymose: corolla white or pinkish, funnel-form, 3–5 mm. long; tube slender, as long as the limb; throat rather wide with a saccate gibbosity at its base on the ventral side: stamens and style exserted: stigma-lobes relatively long: fruit yellowish, almost orbicular as viewed from the ventral side, 3–3.5 mm. long, glabrous or finely pubescent; fertile cell ovoid, much narrower than the widely divergent sterile cells and protruding beyond them in a tooth at the apex; sterile cells extending wing-like about the fertile cell with a notch at each end; all cells nerved; cross section of fruit crescent-shaped.—Low moist grounds from New Jersey and Pennsylvania westward to Illinois, and south-

ward to Virginia, North Carolina and Tennessee. New Jersey: low ground near Redbank, Gloucester Co., May 13, 1871, *C. F. Parker.* Pennsylvania: Columbia, Lancaster Co., June, 1871, *Knipe and Porter;* meadow near Sellersville, June 7, 1893, *Porter.* Virginia: open wet roadside near Natural Bridge, May 19, 1911, *C. F. Batchelder;* rich low meadow along the Potomac near Black Pond above Great Falls, May 24, 1925, *N. Hotchkiss,* no. 1942. North Carolina: Swain Co., May 26, 1897, *Biltmore Herbarium,* no. 4755 (in part). Ohio: Granville, May 10, 1890, *H. L. Jones;* Columbus, *Sullivant* (probably type). Illinois: Forest of Arden, Ottawa, May 30, 1905, *H. C. Skeels,* no. 613 (in part). Tennessee: near Nashville, 1880, *G. W. Hubbard,* no. 1149.

In the Gray Herbarium and in the herbarium of the New York Botanical Garden are specimens labeled "*Fedia patellaria,* Columbus, Ohio, *Sullivant*" and named *V. Woodsiana* var. *patellaria* by Gray. These are doubtless to be considered type material.

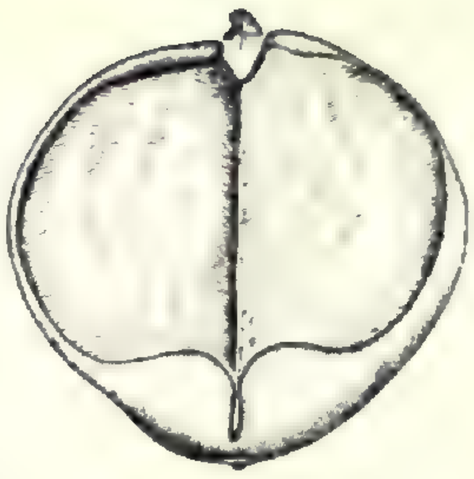
In 1872, T. C. Porter reduced *V. patellaria* to varietal rank under *V. radiata,* contending that by the lateral extension of the sterile cells in the fruits of *V. radiata* those of *V. patellaria* might be formed. Later, in 1883, A. Gray placed *V. patellaria* as a variety under *V. Woodsiana* without giving any reasons for the change. It has continued as a variety under that species through all of the manuals and floras with the exception of those of J. K. Small, where it is given specific rank. The present study would seem to indicate that it is specifically distinct. Besides the great difference in the fruits, the corolla of *V. patellaria* is from 3–5 mm. long as opposed to 1.5–2 mm. in both of the other species. Also there is a difference in range. *V. patellaria* is an Alleghenian species whereas *V. Woodsiana* is restricted to eastern Oklahoma and Texas.

4. V. umbilicata (Sulliv.) Wood. *Fedia umbilicata* Sulliv., Am. Jour. Sci. **42**: 50 (1842). *V. umbilicata* Wood, Class Book, 405 (1861); Krok, Svensk. Akad. Handl. **5**: 67 (1864); Small, Fl. Se. U. S. ed. 1 & 2, 1129; Small, Man. Se. Fl., 1278. *V. radiata,* var. *umbilicata* Porter, Am. Nat. **6**: 387 (1872). *V. Woodsiana,* var. *umbilicata* A. Gray, Proc. Am. Acad. **19**: 82 (1883); A. Gray, Syn. Fl. N. Am. **1,** pt 2: 45; Robinson & Fernald, Gray's Man. ed. 7, 763; Britton & Brown, Ill. Fl. **3**: 247 & ed. 2, **3**: 288.—Stem 3–6 dm. high, nearly glabrous: leaves glabrous or weakly ciliate; the lower usually ciliate, spatulate, slightly connate, entire; the upper usually glabrous, ovate with coarse teeth near the base: bracts glabrous, lanceolate, sometimes very weakly glandularly fimbriate-serrulate toward the tip: inflorescence loose, corymbosely cymose: corolla white or pink, funnel-form, 3–5 mm. long; tube slender, about the length of the limb; throat rather wide

1a

1b

3a



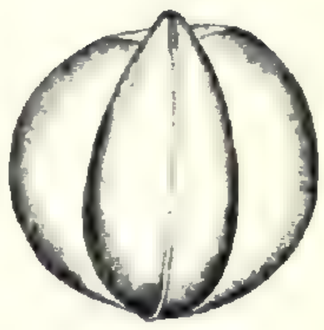
3b

3c

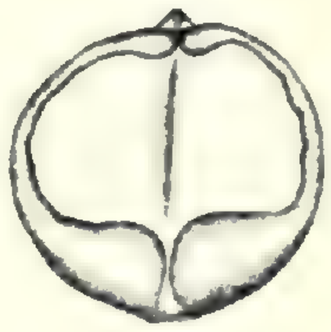
2a

2b

2c



4a



4b

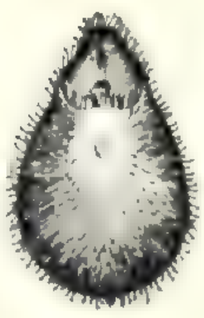
4c

5b

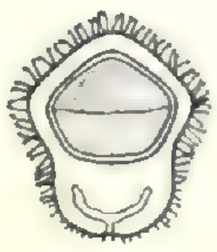
5a

6a

6b



6c



6d

8a

8b

8c

8d

7a

7b

7c

7d

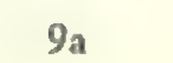
9d

10a

10b

10c

10d



9a

9b

9c

Fruits of Valerianella, × 12

V. olitoria: fig. 1a, cross section; 1b, lateral view. V. Woodsiana: fig. 2a, dorsal view; 2b, ventral view; 2c, cross section. V. patellaria: fig. 3a, dorsal view; 3b, ventral view; 3c, cross section. V. umbilicata: fig. 4a, dorsal view; 4b, ventral view; 4c, cross section. V. chenopodifolia: fig. 5a, cross section; 5b, dorsal view. V. amarella: fig. 6a, dorsal view; 6b, lateral view; 6c, ventral view; 6d, cross section. V. texana: fig. 7a, dorsal view; 7b, lateral view; 7c, ventral view; 7d, cross section. V. carinata: fig. 8a, dorsal view; 8b, lateral view; 8c, ventral view; 8d, cross section. V. stenocarpa: fig. 9a, dorsal view; 9b, lateral view; 9c, cross section. V. stenocarpa, var. parviflora: fig. 10a, dorsal view; 10b, lateral view; 10c, ventral view; 10d, cross section.

with a saccate gibbosity at its base on the ventral side: stamens and style exserted: stigma-lobes short: fruit yellowish, 2–2.5 mm. long, globular-ovoid, glabrous; inflated sterile cells wider and thicker than the flattish ovoid fertile cell; margin of sterile cells ventrally incurved forming a deep umbilicus; fruit cup-shaped as viewed from the ventral surface; all cells one-nerved.—Low moist ground from New York westward to Illinois and Tennessee. NEW YORK: Yonkers, *E. C. Howe;* New Baltimore, Greene Co., 1870, *Howe.* OHIO: Columbus, *Sullivant* (probably type). ILLINOIS: Ottawa, *J. W. Huett.* TENNESSEE: Nashville, 1880, *Martindale.*

A specimen in the Gray Herbarium collected by Sullivant labeled, "*Fedia umbilicata,* Sullivant, in Sill. Jour." is doubtless type material.

In 1872, T. C. Porter also reduced this species to varietal rank under *V. radiata,* assuming that the fruits of this species might be formed not by the lateral extension of the sterile cells as he contends the fruit of *V. patellaria* might have arisen, but by the expansion of the sterile cells where the partition between them is lacking. Gray, in 1883, recognized it as a variety under *V. Woodsiana* but gives no reasons why he considers it as such. Like *V. patellaria,* it has continued as a variety under *V. Woodsiana* through all of the manuals and floras with the exception of those of J. K. Small where it is given specific rank. The present study would seem to indicate that it is also specifically distinct. The fruits of this species are more globular with a pit-like depression between the sterile cells instead of a groove and the corollas are two or more times the size of those of *V. radiata* and *V. Woodsiana.*

V. umbilicata is most closely related to *V. patellaria* from which it differs in having a smaller globular fruit with a pit-like depression between the sterile cells as opposed to the large, dorsiventrally compressed fruits of the latter which have a wide groove between the sterile cells.

5. V. CHENOPODIFOLIA (Pursh) DC. *Fedia chenopodifolia* Pursh, Fl. Am. Sept. **2**: 727 (suppl.) (1814). *V. chenopodifolia* DC., Prod. **4**: 627 (1830); A. Gray, Syn. Fl. N. Am. **1**, pt 2: 45; Britton & Brown, Ill. Fl. **3**: 246 and ed. 2, **3**: 287; Robinson & Fernald, Gray's Man. ed. 7, 762; Rydberg, Fl. Prairies and Plains Cent. N. Am. 760. *Fedia triquetra* Hochst. & Steud. in exs. Un. itin. (1837); Krok, Svensk. Kongl. Akad. Handl. **5**: 54 (1864). *Fedia Fagopyrum* T. & G., Fl. N. Am. **2**: 51 (1841).—Stem 1.5–6 dm. high, glabrous: leaves glabrous except for tufts of hairs on each side of the base near the nodes; the lower ovate-spatulate, entire; the upper narrowly lanceolate, sessile with a few teeth near the base: bracts glabrous, broadly lanceolate:

inflorescence loose, corymbosely cymose; glomerate cymules few: corolla white, 3–4 mm. long, funnel-form with a saccate gibbosity at the base of the throat on the ventral side; tube slender, about as long as the limb: stamens and style exserted: stigma-lobes short: fruit yellowish brown, 3–4 mm. long, glabrous or finely pubescent; fertile cell ovoid, broad, dorsally flattened, much wider than the combined width of the sterile cells; groove between the sterile cells narrow and shallow; cross section of fruit triangular with the ventral angle rounded and grooved.—Shady moist places from Ontario, New York, and Pennsylvania, westward to Ohio and Indiana. Ontario: Point Abino, *W. Johnson.* New York: gulf road 1 mile north of Le Roy, May 23, 1921, *M. S. Baxter*, no. 5568; poor limy flat field, Le Roy, May 22, 1921, *Wiegand*, no. 14057; Utica, 1832, *Gray.* Pennsylvania: Huntington, *Kelly;* Allegheny Co., May 19, 1871, *Knipe and Porter.* Ohio: shady places on the Miami, 1833, *Frank*, no. 671; Columbus, *Sullivant.* Indiana: Studebaker's woods, South Bend, *Nieuwland*, no. 10110.

Fedia chenopodifolia was founded on a specimen in the Sherard Herbarium, now at Oxford. Pursh's description is brief and not distinctive as characters are now used. An examination of the type by Gray in 1883 revealed it to belong to the present species and to be the same as Hochstetter and Steudel's *F. triquetra* and the *F. Fagopyrum* of Torrey and Gray. The writer has also examined the type and would confirm Gray's identification. It may be mentioned, however, that Pursh cited it "In Virginia. ⊙. *v. s. in Herb. Sherard.*" No specimens have been seen by the writer from south of Pennsylvania.

This species is peculiar in having large buckwheat-like fruit and does not seem closely related to any other *Valerianella* known to the writer.

6. V. amarella (Lindh.) Krok. *Fedia amarella* Lindh. Mss., Gray, Plant. Lindh. pt. 2, in Boston Jour. Nat. Hist. **4**: 217 (1857). *V. amarella* Krok, Svensk. Kongl. Akad. Handl. **5**: 55 (1864); A. Gray, Syn. Fl. N. Am. **1**, pt 2: 45; Coulter, Fl. W. Texas, 163; Small, Fl. Se. U. S. ed. 1 and 2, 1129.—Stem 1.5–3 dm. high, glabrous: leaves glabrous except for tufts of hairs on each side of the base near the nodes; the lower obovate-spatulate, entire; the upper oblong-obovate, sessile: bracts glabrous, ovate-lanceolate, rounded or acute at the apex: inflorescence compact, corymbosely cymose: corolla white, funnel-form, 1.5–3 mm. long; limb usually as long as the throat and tube combined; a saccate gibbosity at the base of the throat on the ventral side: stamens and style usually long-exserted, sometimes either stamens or style short and abortive: stigma-lobes short: fruit 1.5–2 mm. long, subglobose, ovoid, brownish, hirsute with rather long uncinate white hairs; sterile cells much smaller than the

large fertile cell, contiguous, groove between them narrow and very shallow or inconspicuous.—Rocky calcareous open hills or low grounds and barrens; eastern Kansas, Oklahoma, and Texas. Previously known only from Texas. KANSAS: Paola, Miami Co., June 11, 1884, *Oyster*. OKLAHOMA: meadow north of Blanchard, May 11, 1924, *Olive S. Davidson*, no. 15; Arbuckle Mts., April 22, 1927, *Lois Gould;* low damp grounds, 1 mile northeast of Norman, April 1926, *Jeffs*, no. 22 and no. 30; low grounds, Campus, April 28, 1924, *Rieger*, no. 48; rich sandy soil by stream, near R. R. south of Dougherty, Murray Co., May 1, 1926, *Robert Stratton*, no. 65 (in part); on Little River, Cleveland Co., June 15, 1903, *A. H. Van Vleet*, no. 506. TEXAS: "common on prairies," Dallas, April 13, 1900, *Bush*, no. 574; Leon Springs, Bexar Co., "Tropical life Zone," May 29, 1911, *Mr. & Mrs. J. Clemens*, no. 495; 8 miles south of Bulverde, Bexar Co., May 2, 1933, *Cory*, no. 6085; roadside and field in barren rocky soil about 35 miles south of Dallas, Ellis Co., May 19, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 214; roadside and field north of Temple, Bell Co., May 20, 1936, *Dyal, Fisher & Hazard*, no. 217; dry bed of Barton Creek, Austin, Travis Co., May 21, 1936, *Dyal, Fisher & Hazard*, no. 216; dry bed of Bull Creek west of Austin, Travis Co., May 21, 1936, *Dyal, Fisher & Hazard*, no. 215; dry hills, Austin, *Elihu Hall*, no. 295; Belkenys, *Sutton Hayes*, no. 338; Kerrville, April 19–25, 1894, *Heller*, no. 1623; Comanche Springs, New Braunfels, etc., May, 1849, *Lindheimer*, no. 850 and no. 851 (type collection); Sonora, April 14, 1930, *Marcus E. Jones*, no. 2608; Camp Bullis, north of San Antonio, April 12, 1931, *Susan D. MacKelvey*, no. 1812; vicinity of Colorado City, May 28, 1883, *Oyster;* rocky open ground, Boerne, Kendall Co., May 19, 1916, *E. J. Palmer*, no. 9828; rocky open grounds, Boerne, April 21, 1917, *Palmer*, no. 11620; open calcareous ground, Cedar Park, Williamson Co., April 18, 1828, *Palmer*, no. 1349; light soil, Dallas, May–June, *Reverchon;* dry uplands, Dallas, April–May, 1881, *Reverchon*, no. 400; "common," Tarrant Co., May 2, 1912, *Ruth*, no. 52.

This species was based by Gray on material collected by Lindheimer in Texas in 1849. The description was communicated to him by Engelmann from Lindheimer's manuscript. In the various herbaria are specimens no. 850 and 851 collected by Lindheimer in 1849 which have "Type Collection" written on the label and these should be considered the type.

The greater number of plants of this species have large flowers with normal exserted style and stamens, but there are a few with small flowers having short and apparently abortive stamens and still fewer with large flowers and short apparently abortive styles. All of these plants have an abundance of fruits which suggest that the style may be slow in growing. This condition is apparently to be found in other

species also, as in some plants the styles are short in the very young flowers while in the more mature flowers they exceed the stamens in length. Where the small flowers with the short apparently abortive stamens are concerned, however, another factor must be involved since the entire plant is more congested.

This species apparently has a much longer flowering period than any of the other species growing in the same region. The writer collected it in good flowering and fruiting condition during the latter part of May 1936 in and near the Edwards Plateau region. Other species normally growing in Texas were either completely out of fruit for the season or in the last fruiting stages.

7. V. **texana,** sp. nov., caule 1–3 dm. alto, gracili, in angulis pubescenti; foliis margine et pagina superiore pubescentibus, inferioribus spathulatis, superioribus oblongo-ovatis; bracteis lanceolatis ciliatis; inflorescentia laxe et corymbose cymosa; corolla alba infundibulariformi 2–2.5 mm. longa; tubo gracili limbum subaequante; faucibus sublatis basi non gibbosis; staminibus styloque exsertis; lobis stigmatis brevibus; fructu stramineo a latere compresso pubescenti capillis brevibus capitatis in seriebus quattuor in longitudinem, seriebus duobus quorum pagina dorsali loculi fertilis, et serie una pagina ventrali loculorum sterilium singulorum dispositis; loculo fertili anguste oblongo apice mucronato quam latitudine fructus valde angustiore; valle inter loculos steriles angusta profunda in medio costata.

Stem 1–3 dm. high, rather frail, pubescent on the angles: leaves hairy on the margin and upper surface; the lower spatulate; the upper oblong-ovate, sessile: bracts lanceolate, ciliate: inflorescence loosely and corymbosely cymose: corolla white, funnel-form, 2–2.5 mm. long; tube slender, about as long as the limb; throat rather wide without a conspicuous gibbosity at its base; stamens and style exserted: stigma-lobes short: fruit yellowish, laterally compressed, with four lines of short capitate hairs, 2 down the dorsal side of the fertile cell and one down the ventral side of each sterile cell; fertile cell narrowly oblong, produced at apex into a prominent tooth, much narrower than the combined width of the sterile cells which have a narrow deep groove between them with a prominent nerve down the middle of the groove. —Moist stream-banks in the vicinity of Kini Creek. Texas: Kini Creek, Gillespie Co., *Gustav Jermy Herbarium*, no. 137 (type in Herb. Missouri Bot. Gard.).

Although only four plants have been seen, the flowers and fruits seem distinct enough to warrant the treatment of this as a species. Indeed it does not appear to be closely related to any other species known to the writer either in North America or in Europe. Further

search should be made for it in south-central Texas. During the latter part of May 1936, the writer attempted to locate it in Texas. Since none of the available topographical maps of Gillespie County indicated the location of "Kini Creek," those in authority at the county court house were consulted. No one knew of a "Kini Creek" and there was no record of a creek by that name. It was suggested, however, that the creek running through a farm owned by a Mr. Kiehne might be the one intended. Accordingly the creek-banks were searched carefully but no trace of a *Valerianella* could be found. As the season was far advanced and the creek-banks were being fast inundated by frequent rains, the search was discontinued for the time, to be resumed another year earlier in the season.

8. V. CARINATA Loiseleur, Not. de Fl. de France, 149 (1810). *Fedia caniculata* Spenn., Fl. Freiburg, 478 (1826). *V. praecox* Willkomm, Pugill. pl. nov. penins. Pyren. Linnaea **30**: 104 (1859).—Stem 0.5–5 dm. high, rather frail, pubescent: leaves hairy on the margin and upper surface; the lower obovate-spatulate, entire; the upper oblong-ovate with few teeth near the base: bracts ciliate, apex blunt or rounded: inflorescence loosely corymbose-cymose: corolla white with purplish-blue limb, 1.5–2 mm. long; tube and throat together about as long as the limb; a saccate gibbosity at base of throat on ventral side: stamens and style slightly exserted: stigma-lobes short: fruits yellowish, oblong, 1.5–2 mm. long, finely pubescent; fertile cell smaller than the combined width of the sterile cells; margin of the sterile cells ventrally incurved forming a deep cavity with a prominent nerve down the middle; a conspicuous nerve down each sterile cell near the margin.—Moist damp rocky places in Oregon. Introduced from Europe. OREGON: in crevices of stone fence, Salem, April 1915, no. 43 and May 1917, no. 1152, *J. C. Nelson;* rocky cliffs along Willamette River, 2 miles south of Oregon City, May, 1918, *Nelson*, no. 2111.

The name *V. carinata* is the one generally accepted for this species in European floras.

This species, from Europe, is here included in the North American flora for the first time. J. C. Nelson collected it in Orgeon in 1915, 1917 and again in 1918 but confused it with *V. Locusta.* It is very similar to this latter species but there is no corky mass on the dorsal side of the fertile cell, which is so prominent on the fruits of *V. Locusta.* The plant has also been collected in Venezuela, where it is reported as having been introduced.

9. V. STENOCARPA (Engelm.) Krok. *Fedia* (*Valerianella*) *stenocarpa* Engelm. Mss., Gray, Plant. Lindh. pt. 2, in Boston Jour. Nat.

Hist. **4**: 216 (1857). *V. stenocarpa* Krok, Kongl. Svensk. Akad. Handl. **5**: 64 (1864); Gray, Syn. Fl. N. Am. **1**, pt. 2: 45; Britton & Brown, Ill. Fl. **3**: 246 and ed. 2, **3**: 287; Robinson & Fernald, Gray's Man. ed. 7, 763; Rydberg, Fl. Pr. Pl. Cent. N. Am. 760; Small, Fl. Se. U. S. ed. 1 and ed. 2, 1129.—Stem 1–5 dm. high, pubescent on the angles: leaves ciliate; the lower spatulate with their bases connate, entire; the upper usually ovate with a few teeth on each side near the base: bracts lanceolate, glabrous or rarely weakly glandularly fimbriate-serrulate toward the tip: inflorescence loose, corymbose-cymose: corolla white, 2–3 mm. long, funnel-form; tube short, less than one-half the length of the limb; a saccate gibbosity at the base of the throat on the ventral side: stamens and style exserted: stigma-lobes short: fruit yellowish, narrowly ellipsoid, more than twice as long as wide, glabrous or pubescent; fertile cell wider than the combined width of the sterile cells, rounded on the dorsal side, sometimes with a weak nerve down the middle; groove between the slender sterile cells narrow, rarely with a rather prominent nerve down the middle.—Rocky ledges and low moist grounds along rivers in central and eastern Texas. Texas: Austin. *Berlandier*, no. 334; Solado River, *Havard*, no. 21; Medina River, April 3, 1932, *Marcus E. Jones*, no. 29229; thickets in light soil, San Antonio, 1849, *Lindheimer*, no. 407; margin of thickets on wet prairies, New Braunfels, April, 1850, *Lindheimer*, no. 456; Comanche Spring, New Braunfels, etc., March 1851, *Lindheimer*, no. 852 (these all from type localities); rocky grounds along wooded bluffs of Guadalupe River, near Kerrville, May 7, 1928, *E. J. Palmer*, no. 33788; moist grounds along river, Kerrville, April 8, 1917, *E. J. Palmer*, no. 11500; below Bluffs, Guadalupe River, Kerrville, May 16, 1918, *E. J. Palmer*, no. 13624; on barren sterile land, Tarrant Co., May 17, 1921, *Ruth*, no. 52 (in part).

This species was based by Engelmann on material collected in Texas by Lindheimer in 1846 ("no. 407"). In the herbarium of the Missouri Botanical Garden is a specimen, which is doubtless to be considered the type. This is numbered 407 and the label, written by Lindheimer in German script, when translated reads as follows, "common on moist prairies and along swift stream banks, near New Braunfels and San Antonio." There are two other specimens collected by Lindheimer which bear the same number, "407," as the above. One is in the herbarium of the University of California. The other is in the Gray Herbarium. These are doubtless also specimens from the type collection.

The fruits of this species are narrowly ellipsoid and the corollas are 2–3 mm. long (usually 3 mm.) as opposed to the ovoid or nearly orbicular fruits, and corollas 1.5–2 mm. long (usually 1.5 mm.), of *V. radiata* and *V. Woodsiana*.

The writer searched for this species in Texas during the latter part of May, 1936 but failed to locate it. Specimens had been collected by others on May 16, 1918 and May 17, 1921, but apparently in 1936 the season was much farther advanced.

10. V. STENOCARPA (Engelm.) Krok, var. **parviflora**, var. nov., corolla alba infundibulariformi 1.5 mm. longa; ab forma typica fructu plus minusve minori recedit.

Corolla white, funnel-form, 1.5 mm. long: fruit slightly smaller than in the typical form of the species.—Light soils, barrens, and prairies of Missouri, Oklahoma, and Texas. MISSOURI: "common in barrens," Dodson, Jackson Co., June 10, 1896, *Bush*, no. 793; "common," Dodson, May 11, 1895, *Mackenzie*, no. 293. OKLAHOMA: "common," Sapulpa, April 28, 1895, *Bush*, no. 1272; vicinity of Ft. Sill, May 3, 1916, *Mr. & Mrs. Joseph Clemens*, no. 11789; growing with *V. radiata* along stream-bank near roadside north of Antlers, Pushmataha Co., May 18, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 248 (TYPE in Herb. Cornell Univ.). Arbuckle Mts., April 1, 1916, *W. H. Emig*, no. 402; Muskogee Co., Sec. 22, T. 14 N., R. 18 E., April 23, 1927, *E. L. Little*, no. 1572. TEXAS: woods, Hempstead, April 24, 1872, *Elihu Hall*, no. 294; "common in woods," Dallas, April 14, 1900, *Bush*, no. 601; prairies north of Dallas, May 3, 1900, *Eggert;* light soil, Dallas, May 15, 1900, *Reverchon*, no. 2124.

This variety has a wider and more northern range than the typical form.

Because of the advanced season the writer was able to locate but a single specimen of this species during the latter part of May, 1936. Some of the seeds, however, were planted in the greenhouse at Cornell University and are at this writing in good flowering condition.

11. V. **Palmeri**, sp. nov., caule 1.5–5 dm. alto in angulis pubescenti; foliis ciliatis, inferioribus spathulatis connatis integris, superioribus plerumque ovatis non connatis ad basin paucidentatis; bracteis lanceolatis glabris; inflorescentia laxa corymbose cymosa; corolla alba infundibulariformi 3–4 mm. longa; tubo gracili limbo breviore; faucibus basi gibbosis; staminibus et stylo exsertis; lobis stigmatis brevibus; fructu subflavo 2.5–4 mm. longo ovoideo a dorso compresso; loculo fertili uni-nervato vel enervato, quam loculis sterilibus subabortivis valde latiore; valle inter loculos steriles angustissima.

Stem 1.5–5 dm. high, pubescent on the angles: leaves ciliate; the lower spatulate, connate, entire; the upper usually ovate, not connate, with a few teeth on each side near the base: bracts lanceolate, glabrous: inflorescence loose, corymbosely cymose: corolla white, funnel-form, 3–4 mm. long; tube slender, shorter than the limb; a saccate gibbosity at the base of the throat on the ventral side: stamens and style exserted: stigma-lobes short: fruit yellowish, 2.5–4 mm. long, ovoid,

flattened dorsiventrally; fertile cell with or without a prominent nerve, much wider than the slender almost abortive sterile cells; groove between the sterile cells very narrow.—Rocky banks and open woods in ARKANSAS: Hot Springs, April, 1924, *Mrs. J. Connell* (in part); rocky ledges and open woods, Magnet Cove, Hot Springs Co., April 19, 1926, *E. J. Palmer*, no. 29726 (TYPE in Herb. Missouri Bot. Gard.); rocky open banks near Hot Springs, Garland Co., May 14, 1924, *E. J. Palmer*, no. 24898; rocky banks near Hot Springs, Garland Co., April 22, 1924, *E. J. Palmer*, no. 24476; Baker Springs, Howard Co., April 12, 1909, *John H. Kellogg*.

This species resembles *V. stenocarpa* in general aspect but the fruits are ovoid instead of ellipsoid. Also there is a difference in range, *V. Palmeri* being known only from Arkansas and *V. stenocarpa* from Texas. Unfortunately the writer was not able to locate this species during May 1936, because of the advanced season.

12. V. **intermedia**, sp. nov., caule 1.5–3 dm. alto in angulis pubescenti; foliis ciliatis, inferioribus spathulatis connatis integris, superioribus oblongo-ovatis non connatis ad basin paucidentatis; bracteis plerumque glabris lanceolatis, exterioribus in plantis junioribus ciliatis; inflorescentia laxa corymbose cymosa; corolla alba vel subpunicea infundibulariformi 3–5 mm. longa; tubo gracili limbum subaequante; faucibus basi gibbosis; staminibus et stylo exsertis; lobis stigmatis brevibus; fructu subflavo 2–2.5 mm. longo ovoideo glabro vel pubescente; loculo fertili quam loculis sterilibus duobus valde latiore a dorso compresso in medio plerumque uni-nervato in marginibus subacuto; fructu inter loculos steriles anguste et non profunde canaliculato, utrinque inter loculum fertilem et loculos steriles valde uni-nervato.

Stem 1.5–3 dm. high, pubescent on the angles: leaves ciliate; the lower spatulate, connate, entire; the upper oblong-ovate, not connate, with a few coarse teeth near the base; bracts usually glabrous, lanceolate, the outer ones in young specimens ciliate: inflorescence loose, corymbosely cymose: corolla white or pinkish, funnel-form, 3–5 mm. long; tube slender, about as long as the limb; a saccate gibbosity at the base of the throat on the ventral side: stamens and style exserted: stigma lobes short: fruit yellowish, 2–2.5 mm. long, ovoid, glabrous or pubescent; fertile cell broader than the combined width of the sterile cells, flat on the dorsal side, usually with a prominent nerve down the center, edges rather acute; groove between the sterile cells narrow and shallow; a prominent nerve on each side of the fruit between the fertile and sterile cells.—Low moist grounds from Massachusetts and Connecticut to Illinois and southward to North Carolina and Kentucky. Specimens from North Carolina are without doubt cultivated. Among 50 specimens examined were the following: MASSACHUSETTS: Stockbridge, June, 1891, *Shear;* Springfield, near B. & A. railroad, July, 1892, *Maria L. Owen*. CONNECTICUT: marshy

field, Suffield, June 19, 1923, *J. F. Smith*, June, 1934, *J. F. Smith* and *F. H. Sargent*. NEW YORK: Mohawk flats near Utica, June 12, 1873, *Haberer;* alluvial meadows, Mohawk flats, Utica, June 17, 1872, *Haberer*, no. 404; in wet pasture north of Chenango River east of Greene, Chenango Co., June 18, 1924, *Muenscher, C. L. Wilson*, and *A. S. Foster*, no. 15976 (TYPE in Herb. Cornell University); Newark, Wayne Co., May 9, 1871, *Hankenson*. NEW JERSEY: near Red Bank, Gloucester Co., May 25, 1871, *C. F. Parker*, no. 2865. PENNSYLVANIA: Washington Co., *W. H. Brewer;* Little Conestoga, April, 1889, *J. H. Eby;* moist banks along Darby Creek, Coopertown road, Delaware Co., May 16, 1930, *Fogg*, no. 4098; meadow below Williams, York Co., June 3, 1895, *Glatfelter;* banks of Little Conestoga, Lancaster Co., May 18, 1889, *Heller;* bank of Tolpehocken Creek, South Bernville, Berks Co., May 15, 1932, *F. J. Hermann* and *H. N. Stoudt*, no. 2900; York Furnace, May 14, 1899, *MacElwee*, no. 227; Bucks Co., May 1865, *Moyer*, no. 2866; Stewart to Perrysville, Allegheny Co., May 31, 1901, *J. A. Shafer*, no. 320; bank of Schuylkill River, Tunnell Hill, Phoenixville, Chester Co., May 18, 1929, *H. E. Stone*. DISTRICT OF COLUMBIA: low thickets near Great Falls of the Potomac, rare, May 10, 1899, *Holm*. NORTH CAROLINA: Hyams Garden, Statesville, June 6, 1879, *Redfield*, no. 11736. OHIO: Columbus, 1842, *Sullivant;* June 23, 1891, *Werner*, no. 371; moist grounds, Mansfield, May 20, *E. Wilkinson*, no. 4382. INDIANA: in swamp along Raccoon Creek, 4 miles south of Russellville, May 18, 1911, *Grimes*, no. 487; flood-plain of creek, Ft. Harrison near Indianapolis, Marion Co., May, 1926, *William Rhoades;* Lick Creek, Ingalls, Madison Co., May 26, 1913, *H. H. Smith*, no. 3635. ILLINOIS: Deer Park Canyon, Lasalle Co., June 1–7, 1909, *Greenman, Lansing & Dixon*, no. 134; Forest of Arden, Ottawa, May 30, 1905, *Skeels*, no. 613 (in part). KENTUCKY: 1840, *Short*.

The name *intermedia* was chosen because of the apparently intermediate position of these plants between *V. chenopodifolia* and *V. radiata*.

The specimens forming the basis of this species were found scattered in the herbaria under various names. In large flower and shape of fruit they bear a great similarity to *V. chenopodifolia* but in foliage, pubescence and size of fruit they are more like *V. radiata*. They can also be readily distinguished from *V. radiata* and its varieties by the large (3–5 mm. long) corollas. As in several other species there are both glabrous- and pubescent-fruited forms. The glabrous fruits are more common in the northern part of the range. The pubescent form tends to be slightly smaller than the glabrous form.

The rosettes formed by the plants grown in the greenhouse at Cornell University from seeds collected near Oxford, Ohio and sent

to the writer by Dr. R. S. Snell tend to strongly support the contention that this new plant is a specific entity. The leaves are ovate, petiolate with the leaf-blade abruptly rounded to the petiole and only slightly decurrent on the latter. In the rosettes of the other species grown, *V. amarella*, *V. Bushii*, *V. chenopodifolia*, *V. longiflora*, *V. ozarkana*, *V. Nuttallii*, *V. radiata* and varieties, *V. stenocarpa* var. *parviflora*, and *V. Woodsiana*, the leaves are spatulate or strap-like with the blade gradually decurrent on the petiole. Outline drawings of the two types of rosettes are shown on Plate 492 and will give the reader a clearer idea of these differences.

13. V. radiata (L.) Dufr. *Valeriana Locusta*, ε. *radiata* Linn., Sp. Pl. 34 (1753). *Fedia radiata* Michx., Fl. Bor. Am. **1**: 118 (1803); T. & G., Fl. N. Am. **2**: 52 (1841). *Valerianella radiata* Dufr., Hist. Val. 57 (1811); Krok, Kongl. Svensk. Akad. Handl. **5**: 64 (1863); Gray, Syn. Fl. N. Am. **1**, pt. 2: 45; Britton & Brown, Ill. Fl. **3**: 246 and ed. 2, **3**: 287; Robinson & Fernald, Gray's Man. ed. 7, 762; Small, Fl. Se. U. S. ed. 1 and 2, 1129; Small, Man. Se. Fl. 1278.—Stem 1.5–6 dm. high, rather stout and pubescent along the angles: leaves hairy on the margin and on the midrib on the lower surface; the lower oblong-spatulate, connate, entire; the upper oblong-ovate, often coarsely toothed at the base, not connate: bracts lanceolate; the outer slightly ciliate; the inner glabrous: inflorescence loose, corymbosely cymose: corolla white, funnel-form, 1.5–2 mm. long; tube shorter than the limb; a saccate gibbosity at the base of the throat on the ventral side: stamens and style exserted: stigma-lobes short: fruit yellowish, ovoid, 2 mm. long, glabrous or pubescent; fertile cell as broad as or broader than the combined width of the sterile cells; groove between the sterile cells narrow to rather wide and often rather deep; a slight groove on each side between the fertile and sterile cells.—Low moist grounds from Pennsylvania to Kansas, southward to Florida and Texas. Among 100 specimens examined were the following. Maryland: Chesapeake Beach, Calvert Co., May 20, 1905, *H. D. House*, no. 746. Virginia: low ground, Gloucester Court House, May 15, 1930, *L. H. Bailey;* grassy banks, Hampton, May 23, 1912, *B. L. Robinson*. North Carolina: in moist soil among rocks along the French Broad River, Biltmore, Buncombe Co., June 1, 1898, *Biltmore Herbarium*, no. 4755a; near Salisbury, April 28, 1897, *Biltmore Herbarium*, no. 4755 (in part); "Deep-Water," Hot Springs, Madison Co., June 3, 1899, *J. R. Churchill;* in low places, Salem Creek, *Schallert*. South Carolina: Clemson College, Oconee Co., April 16, 1906, *H. D. House*, no. 1850; roadside bank, in moist ground near Congaree Creek, Lexington Co., April 27, 1932, *C. A. Weatherby*, no. 6122 (not typical). Ohio: *Sullivant*. Illinois: rocky hills, St. Clair Co., May 18, 1877, *Eggert;* along stream in mesophytic woods and on rock barrens, Makanda, June 11, 1904, *Gleason;* open damp ground, E. Alton,

Madison Co., June 1904, *F. E. McDonald;* Red Bud, June 3, 1888, *Pammel.* TENNESSEE: Kinsel Springs, Blount Co., May 5, 1929, *W. A. Anderson,* no. 1205; moist woods, Jackson, May 1893, *Samuel M. Bain,* no. 18; Lookout Mt., May 8, 1906, *J. R. Churchill;* fields, Nashville, May, *Gattinger;* waste and open grounds, Memphis, Shelby Co., April 24, 1920, *E. J. Palmer,* no. 17276; thickets, Knox Co., July 1898, *Albert Ruth,* no. 613. GEORGIA: fields, Chickamauga Park, May 25, 1911, *J. R. Churchill;* river road, Georgia State Coll. Agr. Farm, Clarke Co., May 10, 1929, *Miller & Maguire,* no. 1471; sandy base of Pine Mt. 1 mile north of Lithonia, April 28, 1934, *Lily M. Perry* and *M. C. Myers,* no. 1066. ALABAMA: abundant in grass, along roadside near Montgomery, April 22, 1934, *L. H. Bailey,* no. 41; LOUISIANA: vicinity of Covington, May 4, 1920, *Bro. G. Arsène,* no. 11996; near Madisonville, April 14, *Joor.* MISSOURI: low ground, near Concordia, April 26, 1927, *L. H. Bailey* and *Ethel Zoe Bailey,* no. 10277; bottoms, Pettis Co., May 29, 1934, *Bush,* no. 13646; damp creek-bank, Seligman, Barry Co., May 9, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard,* no. 227; damp roadside south of Seligman-Barry Co., May 9, 1936, *Dyal, Fisher* & *Hazard,* no. 228; damp roadside south of Holsum, Barry Co., May 9, 1936, *Dyal, Fisher* & *Hazard,* no. 229; damp stream-bank, Eagle Rock, Barry Co., May 9, 1936, *Dyal, Fisher* & *Hazard,* no. 230; moist creek-bank, Noel, McDonald Co., May 10, 1936, *Dyal, Fisher* & *Hazard,* no. 231; rocky open ground, Galena, Stone Co., May 21, 1914, *E. J. Palmer,* no. 5701; near Springfield, May 5, 1890, *Stewart Weller;* "common in open ground," Carthage, Jasper Co., May 12, 1909, *E. J. Palmer,* no. 1993; "common in woods," Eagle Rock, June 15, 1897, *Bush,* no. 181; "common in woods," Neosho, May 30, 1900, *Bush,* no. 426; wet places, Noel, May 10, 1915, *Bush,* no. 7515. ARKANSAS: "common in sandy soil," Varner, Lincoln Co., April 28, 1898, *Bush,* no. 57; "common in sandy soil," Moark, Clay Co., April 21, 1898, *Bush,* no. 22; prairies, Fulton, April 16, 1905, *Bush,* no. 2343; damp sandy roadside, Atkins, Pope Co., May 13, 1936, *Dyal, Fisher* & *Hazard,* no. 238; damp roadside between Waldron and Abbott on route 71, Scott Co., May 14, 1936, *Dyal, Fisher* & *Hazard,* no. 239; dry roadside, Hot Springs, Garland Co., May 14, 1936, *Dyal, Fisher* & *Hazard,* no. 240; roadside between Avoca and Rogers, Benton Co., May 10, 1936, *Dyal, Fisher* & *Hazard,* no. 232; damp roadside north of Fayetteville, Washington Co., May 11, 1936, *Dyal, Fisher* & *Hazard,* no. 233; along stream-bank near bridge over White Creek between Fayetteville and Huntsville, Washington Co., May 11, 1936, *Dyal, Fisher* & *Hazard,* no. 234, damp rocky roadside south of Marble Falls, Pope Co., May 12, 1936, *Dyal, Fisher* & *Hazard,* no. 235; sandy roadside north of Dover, Pope Co., May 12, 1936, *Dyal, Fisher* & *Hazard,* no. 236; sandy roadside, Le Petit Jean State Park, Garland Co., May 13, 1936, *Dyal, Fisher* & *Hazard,* no. 237; Baucum, Pulaski Co., April 16, 1933, *D. M. Moore,* no. 330065; open pasture, west of Viola, *Moore,* no. 300235; Fayette-

ville, Washington Co., May 22, 1936, *E. L. Nielsen*, no. 3703; river bank, Eden's Bluff, near Rogers, Benton Co., June 6, 1936, *Nielsen*, no. 3869; rocky open banks near Hot Springs, Garland Co., May 14, 1924, *E. J. Palmer*, no. 24898; cultivated land, Monte Ne, Benton Co., May 15, 1931, *Eunice Ruddick*, no. 762. KANSAS: Miami Co., June 1885, *Oyster*, no. 3382; low ground, Cherokee Co., 1896, *A. S. Hitchcock*, no. 710. OKLAHOMA: near Ochelata, April 23, 1927, *L. H. Bailey* and *Ethel Zoe Bailey*, no. 10226; damp lowland, one mile east of Norman, May 1, 1928, *Fred A. Barkley*, no. 260; "common," Sapulpa, May 2, 1895, *B. F. Bush*, no. 878; damp roadside south of Tuskahoma, Pushmataha Co., May 18, 1936, *Dyal, Fisher* & *Hazard*, no. 241; damp roadside north of Antlers, Pushmataha Co., May 18, 1936, *Dyal, Fisher* & *Hazard*, no. 242; roadside between Poteau and Wister, Le Flore Co., May 19, 1936, *Dyal, Fisher* & *Hazard*, no. 243; dry roadside west of Hugo, Choctaw Co., May 19, 1936, *Dyal, Fisher* & *Hazard*, no. 245; damp sandy roadside near Finley, Choctaw Co., May 19, 1936, *Dyal, Fisher* & *Hazard*, no. 246; Muskogee Co., Sec. 14, T. 13 N., R. 17 E., Lot no. 7, April 15, 1927, *Elbert L. Little*, no. 1570; valley of Little River west of Ludlow, Le Flore Co., June 8, 1930, *Elbert L. Little*, and *Charles E. Olmsted*, no. 175; granite hills south of Mill Creek, May 12, 1930, *Paul B. Sears*, no. 1319. TEXAS: Ottine Swamp, Gonzales Co., April 30, 1933, *Cory*, no. 5807; dry roadside north of Dallas, Dallas Co., May 19, 1936, *Dyal, Fisher* & *Hazard*, no. 244; dry bed of Bull Creek west of Austin, Travis Co., May 21, 1936, *Dyal, Fisher* & *Hazard*, no. 247; low open woods, Ganado, Jackson Co., March 20, 1916, *E. J. Palmer*, no. 9230; "common in woods," May 2, 1901, *Reverchon*, no. 2604; Victoria, April 26, 1906, *Tracy*, no. 9261; moist woods, Austin, May 1, 1918, *M. S. Young*, no. 133.

The name was based by Linnaeus primarily on the Gronovian reference which in turn was based on Clayton's specimen no. 43. This specimen, in the British Museum, has been seen by the writer. It is labeled *Valeriana Locusta* var. *radiata*.

The fruits are more variable than those of any other species studied. Torrey and Gray proposed the name var. *leiocarpa* for the glabrous-fruited form. In almost every species glabrous- and hairy-fruited individuals occur and it has scarcely seemed wise to distinguish these by formal names.

During May 1936, this species was found to be very common in the Ozark region south to Hot Springs, west into eastern Oklahoma and south to San Antonio, Texas. In southwestern Missouri the roadsides and whole fields were white with it.

14. V. RADIATA (L.) Dufr., var. **missouriensis**, var. nov., loculis sterilibus divergentioribus in tota latitudine loculum fertilem plus minusve excedentibus.

Sterile cells of fruit more widely divergent, making their combined width somewhat greater than the fertile cell.—Low moist or light soils in Missouri and northern Arkansas. MISSOURI: common on prairies, Webb City, May 12, 1902, *Bush*, no. 1616; gravel banks, Oak Grove, June 2, 1913, *Bush*, no. 7019; bottoms, Morgan Co., May 29, 1935, *Bush*, no. 14789 (TYPE in herb. Cornell Univ.); sandy soil, Silex, May 29, 1915, *John Davis*, no. 4418; meadows, Forestell, St. Charles Co., May 25, 1917, *Davis*, nos. 7358 and 7629; Pacific, June 1, 1892, *Dewart;* moist sandy bank south of railroad station, Allenton, St. Louis Co., May 6, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 226; St. Louis, May 18, 1877, *Eggert;* near Arcadia, Iron Co., May 1925, *Greenman*, no. 4779; Allenton, July 1890, *Letterman;* rare and local, barrens, Kansas City, May 17, 1896, *Mackenzie*, no. 229; low ground, Dulle Mill, in Callaway Co., east of Ashland, May 10, 1930, *Rickett;* and in alluvial soil, near Gravis Road, St. Louis Co., May 17, 1906, *James I. Shannon*, no. 245. ARKANSAS: woods, Moark, May 2, 1905, *Bush*, no. 2588.

This variety differs from the typical form only in the more widely diverging sterile cells and the slightly larger fruits.

15. V. RADIATA (L.) Dufr., var. **Fernaldii,** var. nov., a forma typica recedit corolla aliquantum majore; fructu elongatiore plerumque pubescenti; loculo fertili dorso rotundato totam latitudinem loculorum sterilium angustorum valde superante; valle inter loculos steriles tenui vel deficienti.

Corolla slightly larger than in the typical form: fruit more elongate, usually pubescent, fertile cell rounded on the dorsal side, much wider than the combined width of the slender sterile cells; groove between sterile cells slight or wanting.—Low moist places from Connecticut and Pennsylvania, south to North Carolina and westward to Missouri and Texas. CONNECTICUT: slope of terrace, east shore of Niantic River, Waterford, June 12, 1902, *Graves*. PENNSYLVANIA: Huntingdon Co., 1847, *Porter*. VIRGINIA: cultivated field, 1 mile north of Williamsburg, April 30, 1921, *Grimes*, no. 3504; low grounds near stream, 1 mile south of Williamsburg, May 8, 1921, *Grimes*, no. 3545; wooded flood-plains, 3 miles north of Williamsburg, Queens Creek, May 23, 1921, *Grimes*, no. 3617; in clay at roadside east of Little Creek, May 4, 1935, *Fernald & Griscom*, no. 4509 (TYPE in Gray Herb.); sandy roadside west of Pungo, May 6, 1935, *Fernald & Griscom*, no. 4510; border of woods, Land of Promise, May, 1935, *Fernald & Griscom*, no. 4511; grassy banks, Hampton, May 23, 1912, *B. L. Robinson*, no. 412. NORTH CAROLINA: in moist soil among rocks along the French Broad River, Biltmore, Buncombe Co., June 1, 1898, *Biltmore Herbarium*, no. 4755a (in part). MISSOURI: *Greenman*, no. 4068. TEXAS: Sefkey Swamp, Gonzales Co., April 30, 1933, *Cory*, no. 5808; Lufkin, Angelina Co., April 13, 1934, *Cory*, no. 8046.

This variety is named for Dr. M. L. Fernald who first brought it to the attention of the writer in 1935.

16. V. Nuttallii (T. & G.) Walp. *Fedia Nuttallii* T. & G. Fl. N. Am. **2**: 51 (1841). *V. Nuttallii* Walp., Rep. **2**: 527 (1843); Krok, Kongl. Svensk. Akad. Handl. **5**: 97 (1864); Gray, Syn. Fl. N. Am. **1**, pt. 2: 46 (1884). *Siphonella Nuttallii*, J. K. Small, Fl. Se. U. S. ed. 1 and 2, 1129 (1903 & 1913).—Stems 1–3 dm. high, sometimes pubescent on the angles: leaves pubescent on the margin; the lower obovate-spatulate, connate; the upper oblong-ovate, not connate: bracts ovate-lanceolate, strongly glandularly fimbriate-serrulate: inflorescence loose or congested, corymbosely cymose: corolla salver-form, 6–7 mm. long, the ventral lobe slightly longer; limb white; tube pink or white, slender, 4–5 mm. long, twice the length of the limb, with a callous gibbosity near the middle or above, on the ventral side: stamens and style long-exserted: stigma three-lobed, sometimes very conspicuous: fruit yellowish brown, nearly orbicular in ventral view, 2–3 mm. long, glabrous or finely pubescent; fertile cell elongate, much narrower than the large, inflated, divergent sterile cells; outer margin of each sterile cell bearing a strong nerve.—Low moist non-calcareous grounds in Western Arkansas and Eastern Oklahoma. Arkansas: light shaly soil in open meadow north of Alma, Crawford Co., May 5, 1935, *D. M. Moore*, no. 350031; "common in woods," Prescott, May 14, 1900, *B. F. Bush*, no. 262; damp roadside on route 71 south of Winslow, Washington Co., May 14, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 224; damp roadside and in the woods along a stream-bank on route 71 south of Abbott, Scott Co., May 14, 1936, *Dyal, Fisher & Hazard*, no. 224; roadside, Mulberry River near Cass, Franklin Co., May 27, 1936, *E. L. Nielsen*, nos. 3725 and 3726. Oklahoma: wet places 5 miles north of Limestone Gap, May 23, 1877, *Geo. D. Butler*, no. 11109; Limestone Gap, May 19, 1877, *Butler*, no. 101; Limestone Gap, 1875, *Butler;* Muskogee Co., Sec. 27, T. 13 N., R. 17 E., Lot no. 6, April 15, 1927, *E. L. Little, Jr.*, no. 1753; Muskogee Co., Sec. 24, T. 12 N., R. 19 E. about 2 miles east of Warner, May 15, 1927, *Little*, no. 1575.

This species was based by Torrey and Gray on material collected on the plains of Arkansas by Nuttall. A specimen in the herbarium of the New York Botanical Garden collected by Nuttall and labeled *Fedia Nuttallii* is doubtless to be considered the type.

V. Nuttallii differs from *V. longiflora*, *V. Bushii*, and *V. ozarkana* in having a shorter corolla-tube with the gibbosity near the middle or above instead of near the base, in the relatively larger limb, and in the more ovate bracts.

This species was rather common along the roadsides in northwestern Arkansas in May 1936. It was not found growing with *V. longiflora* at any time even though that species grew near.

17. V. **ozarkana**, sp. nov., caulibus 1.5–3 dm. altis in angulis

pubescentibus; foliis margine et pagina superiore ad apicem pubescentibus, inferioribus obovato-spathulatis connatis, superioribus oblongo-ovatis non connatis; bracteis anguste lanceolatis glandulose fimbriato-serrulatis; inflorescentia laxa corymbose cymosa; corolla hypocrateriformi 10–12 mm. longa, lobo ventrali aliquantum longissimo; limbo albo; tubo rufescenti gracili limbum 3–4-plo excedenti ad basin gibboso; staminibus et stylo valde exsertis; lobis stigmatis longis; fructu flavido-fusco 3 mm. longo a latere compresso in seriebus tribus in longitudinem pubescenti, serie una in costa pagina dorsali loculi fertilis et serie una loculis sterilibus singulis; tota latitudine loculorum sterilium loculum fertilem excedenti; valle inter loculos steriles angusta et profunda.

Stems 1.5–3 dm. high, pubescent on the angles: leaves hairy on the margin and on the upper surface toward the tip; the lower obovate-spatulate, connate; the upper oblong-ovate, not connate: bracts narrowly lanceolate, tip acuminate, glandularly fimbriate-serrulate: inflorescence loose, corymbosely cymose: corolla salver-form, 10–12 mm. long, ventral lobe slightly longer than the others; limb white; tube reddish, slender, 3–4 times the length of the limb, with a callous gibbosity near the base on the ventral side: stamens and style long-exserted: stigma-lobes long: fruit yellowish brown, 3 mm. long, laterally compressed with three lines of long whitish hairs, one down the keel-like projection on the dorsal side of the fertile cell and one down each sterile cell; the combined width of the sterile cells greater than the fertile cell; groove between the slightly divergent sterile cells narrow and deep.—Moist rocky calcareous grounds, southwestern Missouri and northwestern Arkansas. MISSOURI: barrens, Eagle Rock, April, 1898, *Bush*, no. 232 (in part); barrens, Noel, May, 1915, *Bush*, no. 7524; rocky cedar woods near stream, Eagle Rock, Barry Co., May 9, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 225 (TYPE in herb. Cornell Univ.); rocky open woods near Seligman, Barry Co., May, 1926, *E. J. Palmer*, no. 29780. ARKANSAS: rich shelves of cliffs and rocky grounds, April, *Harvey*, no. 13421.

Name from the Ozark Mountain where these plants grow.

The laterally compressed fruits of this species can easily be distinguished from the dorsiventrally compressed fruits of the other species of the *Siphonella* group. Also the hairs on the fruits are rather long and arranged in three distinct lines while those on the fruits of the other species, when present, have no definite arrangement.

This species and *V. Bushii* have the same range and are found growing in the same colonies but since their fruits are so very distinct and since they have also been collected in separate colonies the writer feels that they should be considered as different species for the present at least. Seeds of these species were planted in the greenhouse at Cornell University and the fruits produced by these individuals

were like the ones planted. Apparently, therefore, the plant comes true to seed.

18. V. **Bushii**, sp. nov., caule 1.5–6 dm. alto in angulis pubescenti; foliis margine et pagina superiore ad apicem pubescentibus, inferioribus spathulatis plus minusve connatis, superioribus oblongo-ovatis sessilibus non connatis; bracteis anguste lanceolatis glandulose fimbriato-serrulatis acuminatis; inflorescentia laxa corymbose cymosa; corolla 10–12 mm. longa hypocrateriformi, lobo ventrali aliquantum longissimo; limbo albo; tubo rufescenti gracili limbum 3–4-plo excedenti, supra basin (2 mm.) gibboso; staminibus et stylo exsertis; lobis stigmatis longis; fructu flavido-fusco oblongo glabro vel pubescenti; loculo fertili totam latitudinem loculorum sterilium excedenti; loculis sterilibus non divergentibus; valle inter loculos steriles angusta tenui plerumque uni-nervata.

Stem 1.5–6 dm. high, pubescent on the angles: leaves hairy on the margin and on the upper surface toward the tip; the lower spatulate, somewhat connate; the upper oblong-ovate, sessile, not connate: bracts narrowly lanceolate, glandularly fimbriate-serrulate, acuminate: inflorescence loose, corymbosely cymose: corolla 10–12 mm. long, salver-form, ventral lobe slightly longer than the others; limb white; tube reddish, slender, 3–4 times the length of the limb, a callous gibbosity usually 2 mm. from the base in mature flowers: stamens and style long exserted: stigma-lobes long: fruit yellowish brown to brownish, oblong, glabrous or finely pubescent; fertile cell wider than the combined width of the sterile cells, the latter not divergent; groove between the sterile cells narrow and shallow and usually with a prominent nerve down the middle.—Moist rocky calcareous grounds in southwestern Missouri and northwestern Arkansas. Missouri: gravelly hills, Noel, April 25, 1909, *Bush*, no. 5520 and no. 5520a; gravelly woods, Noel, April 24, 1909, *Bush*, no. 5505; rocky cedar woods near stream, Eagle Rock, Barry Co., May 9, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 218 (type, in herb. Cornell Univ.); rocky woods, Galena, Stone Co., May 20, 1914, *E. J. Palmer*, no. 5664; open rocky hillside, Noel, May 1, 1914, *E. J. Palmer*, no. 5437; rocky woods near Galena, May 23, 1923, *E. J. Palmer*, no. 22803. Arkansas: north of Huntsville, Madison Co., April 30, 1923, *Buchholz;* at Withrow Spring, Madison Co., April 29, 1923, *Buchholz;* rocky hills in N. W. Arkansas, June, 1835, *Engelmann*, no. 672 (in part); on flat rock, Fayetteville, Washington Co., 1880, *Harvey;* east of Rogers, Benton Co., May, 1933, *D. M. Moore*, no. 330035; wet brushy banks, Eureka Springs, April 24, 1928, *Aven Nelson*, no. 10872; moist rocky open ledges along bluffs of White River, near Calico Rock, Izard Co., April 27, 1927, *E. J. Palmer*, no. 35576; rich shelves of cliffs and rocky low grounds, N. W. Arkansas, April, *Harvey*.

Name for the late Benjamin Franklin Bush of Courtney, Missouri, who collected many of the specimens cited. The earliest specimen is

11a

11c

11b

12a

12c

12b

13a

13c

13b

14a

14b

14d

14c

15a

15c

15b

16a

16c

16b

17b

17a

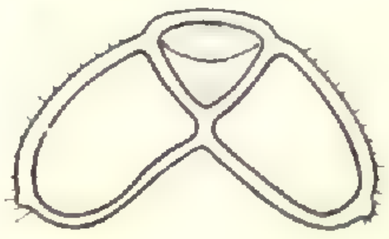
18a

18b

18d

18c

19a



19c

19b

FRUITS OF VALERIANELLA, × 12

V. PALMERI: FIG. 11a, ventral view; 11b, lateral view; 11c, cross section. V. INTERMEDIA: FIG. 12a, lateral view; 12b, ventral view; 12c, cross section, V. RADIATA: FIG. 13a, lateral view; 13b, ventral view; 13c, cross section. V. RADIATA, var. MISSOURIENSIS: FIG. 14a, dorsal view; 14b, ventral view; 14c, lateral view; 14d, cross section. V. RADIATA, var. FERNALDII: FIG. 15a, lateral view; 15b, ventral view; 15c, cross section. V. NUTTALLII: 16a, dorsal view; 16b, ventral view; 16c, cross section. V. OZARKANA: 17a, lateral view; 17b, cross section. V. BUSHII: FIG. 18a, dorsal view; 18b, ventral view; 18c, lateral view; 18d, cross section. V. LONGIFLORA: FIG. 19a, dorsal view; 19b, ventral view; 19c, cross section.

one collected by George Engelmann in 1835 (no. 672), in the herbarium of the Missouri Botanical Garden. In the Gray Herbarium is a plant also collected by Engelmann which is *V. longiflora* and bears the same data and number. The fertile cell of the fruit of *V. Bushii* is larger than the sterile cells while in the other species of the *Siphonella* section it is smaller. This species can readily be distinguished by this character.

19. V. LONGIFLORA (T. & G.) Walp. *Fedia longiflora* T. & G., Fl. N. Am. **2**: 51 (1841). *V. longiflora* Walp., Rep. **2**: 527 (1843); Krok, Kongl. Svensk. Akad. Handl. **5**: 97 (1864); Gray, Syn. Fl. N. Am. **1**, pt. 2: 46; Britton & Brown, Ill. Fl. **3**: 247 and ed. 2, **3**: 288. *Siphonella longiflora* Small, Fl. Se. U. S. 1129 (1903) & ed. 2, 1129.—Stem 1.5–3 dm. high, almost glabrous: leaves glabrous or with only a few cilia; the lower spatulate, connate: the upper linear-oblong, sessile, not connate: bracts lanceolate, glandularly fimbriate-serrulate: inflorescence usually compact, corymbosely cymose: corolla 10–12 mm. long, salver-form, ventral lobe slightly longer than the others; limb white; tube purplish red, slender, 3–4 times the length of the limb, a callous gibbosity near the base on the ventral side: stamens and style long-exserted: stigma-lobes long: fruit yellowish brown, 2–3 mm. long, nearly orbicular in ventral view, glabrous or pubescent; fertile cell narrowly oblong, prominently toothed at apex, much narrower than the inflated, widely divergent sterile cells; outer margin of each sterile cell with one strong nerve.—Low rocky calcareous grounds of western Arkansas and eastern Oklahoma. ARKANSAS: damp fields between Waldron and Abbott, Scott Co., May 14, 1936, *Sarah C. Dyal, Elizabeth Fisher & Helen Hazard*, no. 219; rocky hills in N. W. Arkansas, June, 1835, *Engelmann*, no. 672 (in part); rocky ledges, Devil's Den State Park, near Winslow, Washington Co., May 31, 1936, *E. L. Nielsen*, no. 3811; Booneville, Logan Co., April, 1932, *H. R. Pyle*, no. 614; Clarksville, May 4, *C. Woolsey;* central Arkansas between Little Rock and Ft. Smith, May 19, 1923, *C. Woolsey*. OKLAHOMA: Limestone Gap, 1875, *G. D. Butler;* damp roadside south of Tuskahoma, Pushmataha Co., May 18, 1936, *Dyal, Fisher & Hazard*, no. 220; damp roadside 20 miles north of Finley, Choctaw Co., May 19, 1936, *Dyal, Fisher & Hazard*, no. 221; east of Finley in woodland near Salt Creek, June 20, 1919, *R. E. Jeffs;* along road between Fewell and Nashoba, Pushmataha Co., June 8, 1930, *Elbert L. Little* and *Charles E. Olmsted*, no. 157; Muskogee Co., Sec. 23, T. 15 N., R. 20 E., Lot no. 4, June 11, 1927, *Elbert L. Little*, no. 1574; near Plateau, Le Flore Co., May 2, 1935, *Dwight M. Moore;* gravelly grounds along creek, near Finley, Pushmataha Co., May 26, 1931, *E. J. Palmer*, no. 39400.

This species was based by Torrey and Gray on material collected on the plains of Arkansas by Nuttall. A specimen in the herbarium

of the New York Botanical Garden collected by Nuttall and labeled *Fedia longiflora* is doubtless to be considered as the type.

CORNELL UNIVERSITY, Ithaca, N. Y.

EXPLANATION OF PLATES 492–494

PLATE 492. Corollas of *Valerianella*, × 8, and Rosettes. V. AMARELLA fig. 1. V. NUTTALLII: fig. 2. V. OZARKANA: fig. 3. V. RADIATA, var. FERNALDII: fig. 4. V. RADIATA: fig. 5. V. INTERMEDIA: fig. 6.

PLATE 493. Fruits of *Valerianella*, × 12. V. OLITORIA: fig. 1a, cross section; fig. 1b, side view. V. WOODSIANA: fig. 2a, dorsal view; fig. 2b, ventral view; fig. 2c, cross section. V. PATELLARIA: fig. 3a, dorsal view; fig. 3b, ventral view; fig. 3c, cross section. V. UMBILICATA: fig. 4a, dorsal view; fig. 4b, ventral view; fig. 4c, cross section. V. CHENOPODIFOLIA: fig. 5a, cross section; fig. 5b, dorsal view. V. AMARELLA: fig. 6a, dorsal view; fig. 6b, side view; fig. 6c, ventral view; fig. 6d, cross section. V. TEXANA: fig. 7a, dorsal view; fig. 7b, side view; fig. 7c, ventral view; fig. 7d, cross section. V. CARINATA: fig. 8a, dorsal view; fig. 8b, side view; fig. 8c, ventral view; fig. 8d, cross section. V. STENOCARPA: fig. 9a, dorsal view; fig. 9b, side view; fig. 9c, ventral view; fig. 9d, cross section. V. STENOCARPA, var. PARVIFLORA: fig. 10a, dorsal view; fig. 10b, side view; fig. 10c, ventral view; fig. 10d, cross section.

PLATE 494. Fruits of *Valerianella*, × 12. V. PALMERI: fig. 11a, ventral view; fig. 11b, side view; fig. 11c, cross section. V. INTERMEDIA: fig. 12a, side view; fig. 12b, ventral view; fig. 12c, cross section. V. RADIATA: fig. 13a, side view; fig. 13b, ventral view; fig. 13c, cross section. V. RADIATA, var. MISSOURIENSIS: fig. 14a, dorsal view; fig. 14b, ventral view; fig. 14c, side view; fig. 14d, cross section. V. RADIATA, var. FERNALDII: fig. 15a, side view; fig. 15b, ventral view; fig. 15c, cross section. V. NUTTALLII: fig. 16a, dorsal view; fig. 16b, ventral view; fig. 16c, cross section. V. OZARKANA: fig. 17a, side view; fig. 17b, cross section. V. BUSHII: fig. 18a, dorsal view; fig. 18b, ventral view; fig. 18c, side view; fig. 18d, cross section. V. LONGIFLORA: fig. 19a, dorsal view; fig. 19b, ventral view; fig. 19c, cross section.

SILENE MENZIESII AND ALLIES IN WESTERN CANADA[1]

A. E. PORSILD

E. L. GREENE,[2] in segregating the genus *Anotites* of the *Caryophyllaceae*, taking for his genetic type *Silene Menziesii* Hook., offers the following characterization, op. cit. 97: "ANOTITES. Perennial herbs of low stature growing singly in tufts, or forming extensive colonies by means of connected long horizontal rootstocks. Leafy stems usually freely dichotomous, the flowers scattered or else in leafy-bracted cymes; the whole habit, inflorescence, and small white flowers those

[1] Published by permission of the National Museum, Mines and Geology Branch, Department of Mines and Resources, Ottawa, Canada.

[2] Greene: Leaflets, i. pp. 97–105 (1905).

[of] *Alsine* (or *Stellaria*). Petals bifid, without appendages. Capsule subcrustaceous, equalling the calyx, 5-toothed. Seeds small, numerous."

Except for the one distinct character viz. "*Capsule subcrustaceous*" it is difficult to see in which way this somewhat inclusive description would segregate members of the new genus from those of *Stellaria*, *Silene* and *Cerastium*, and it is perhaps easy to understand why no one seems to have taken up the genus *Anotites*. In fact the only record in subsequent floras is that in Henry's Flora of Southern British Columbia where *Anotites Menziesii* Greene and *A. latifolia* Greene are given as synonyms under *Silene Menziesii* Hook.

In all, Greene op. cit. describes 18 species of *Anotites* of which *A. Menziesii* and *A. Dorrii* Kell. were based on previously described species while the rest were "new." During a recent revision of the *Caryophyllaceae* in the National Museum of Canada the writer examined the types of the following Canadian members of Greene's proposed genus.

ANOTITES DEBILIS Greene, Farewell Creek, Cypress Hills, Sask., June 27, 1885, *Macoun*, 10,124, is a poorly developed, immature, somewhat narrow-leaved SILENE MENZIESII Hook.

A. TERETICAULIS Greene, Alberta: Waterton Lake, Lat. 49° 05′ Rocky Mts., July 29, 1895, *Macoun*, 10,123, the writer can in no way distinguish from typical SILENE MENZIESII Hook.

A. TENERRIMA Greene, Alberta: Thickets, Seven Person's Coulee, Medicine Hat, June 1, 1894, *Macoun*, 3090. Shady, grassy places, Red Deer River, lat. 53° July 16, 1881, *Macoun*, 2596. By Greene designated as "part of type"; both are forms of SILENE MENZIESII Hook.

A. LATIFOLIA Greene, British Columbia: Yale, May 17, 1889, *Macoun*, 66;487. The sheet by Greene himself is designated as type although in the description he cites No. 61,314 which, in Greene's handwriting is marked "part of type." Greene's description op. cit. p. 98 is as follows:

"2. A. LATIFOLIA. Plants evidently forming colonies through a system of superficially seated not slender rootstocks: stoutish stems only 6 or 8 inches high, very leafy and with a reduced and very leafy cyme: leaves 1½ inches long and twice the length of the internodes, ¾ inch broad above the middle, cuneate-obovate to oblong-obovate and broadly elliptical, cuspidately acute, loosely hirtellous beneath, above almost glabrous, margin runcinate-ciliolate; stem retrorsely pubescent throughout, not even the pedicels with either spreading or glandular hairiness:

the few slender pedicels not half the length of the leaves: calyx loosely villous, the oblong-obovate teeth obtusish."

This plant is hardly, as suggested in Henry's Flora, referable to *Silene Menziesii* Hook., but no doubt is a distinct species. In addition to the characters given by Greene may be added, that the stems are *simple*, strict and purplish-coloured, especially below, rising *in fascicles* from the rather stout, horizontal rhizome. The leaves are much firmer in texture than those of *S. Menziesii* and by their obovate outline offer an excellent characteristic which at once distinguishes our plant from all others of that group.

In transferring the plant to *Silene*, Greene's name, preoccupied by *Silene latifolia* (Mill.) Britten and Rendle of Europe, unfortunately cannot be maintained and the following new name is therefore proposed.

Silene **obovata**, nom. nov., *Anotites latifolia* Greene, Leaflets, Vol. 1, p. 98 (1905), not *Silene latifolia* (Mill.) Britten and Rendle.

A. picta Greene, Ottawa Naturalist Vol. 19 (1905) p. 165, British Columbia: Hector, along the C. P. railroad, Aug. 4, 1904, *Macoun* 64,707, in its vegetative parts is a good match for *S. Menziesii*. Although the plant was collected on Aug. 4th the flowers are sterile and have not expanded and indeed look deformed as if they had been attacked by *Ustilago*. Until more material is available it is, perhaps, best to treat *A. picta* as a freakish form of *S. Menziesii*.

Silene Williamsii Britt. Bull. N. Y. Bot. Garden, Vol. 11 (1901) p. 168, apparently was overlooked by Greene: l. c. 1905 p. 163–167, in his treatment of the Canadian members of his segregate "*Anotites*." It no doubt is closely related to *S. Menziesii* but so far has been detected only from the Yukon Territory and from central Alaska. It is easily distinguished, however, by the following characters:

S. Menziesii	S. Williamsii
Calyx—funnelshaped, green, nerveless	urceolate, with dark-green prominent nerves.
Seed—*black*, smooth *and* very *shiny*, oblong-reniform	*brown*, prominently *rugose*-tuberculate, not at all shiny, short-reniform.
Leaf—thin, papery, light green	firm, dark green
Pubescence—not viscid	viscid.

The following specimens have been examined by the writer: Yukon Territory: Dawson, *R. S. Williams*, 1899 (type) (W. O.[1]), *Eastwood*

[1] W—U. S. National Herbarium, Washington. G—Gray Herbarium, Harvard University. O—National Museum of Canada.

332 (W, G, O), *J. Macoun* 54,403 (O); Klondyke: *John MacClean* (G); Fortymile Cr., *Fred. Funston* 149 (W); 63° 45′ N.–141° W., *C. E. Cairnes* (O). ALASKA: between Ramparts and Tanana, *L. J. Palmer* 62 (W, O); Fairbanks: *L. J. Palmer* 1804 and 1825 (W.); *R. T. and A. E. Porsild* 225 (O); Pedro Dome north of Fairbanks, *R. T. and A. E. Porsild* 131 (O); Kokrines Mts., *R. T. and A. E. Porsild* 732 (O); near head of Chitina R. (Mt. Logan Exp.), *H. M. Laing* 61 and 62 (O).

S. Menziesii is decidedly more southern in its distribution and, according to Rydberg's Flora of Rocky Mountains, reaches south to New Mexico and California. In Canada it appears to be common in southern Alberta and British Columbia.

The following specimens represent its known northern limit: YUKON TERRITORY: 50 miles above Stewart River, *J. B. Tarleton* (distributed as *S. Williamsii*) (W); Dawson, Bonanza Cr. *Eastwood* 516 (W, G); Atlin, *Eastwood* 632 (G); BRITISH COLUMBIA: Bennet, Alaska (probably should be Bennett, B. C.), *H. C. Cowles* 988 (unnamed) (W, G.).

NOTES ON EPHEDRA IN TEXAS

V. L. CORY

CONFUSION has long existed concerning a species of *Ephedra* occurring in Texas in the Big Bend portion of the Trans-Pecos Area. For the most part this plant has passed heretofore for *E. antisyphilitica* Berl. ex. C. A. Meyer or for *E. nevadensis* S. Wats. A few years ago the late Marcus E. Jones called to my attention the fact that the latter species, with which he was quite familiar, did not occur in Texas at all. This was brought out while we were looking at a plant of the species occurring commonly on the Edwards Plateau. This bit of knowledge brought home to us that we had two distinct species of Ephedra with only one name for the two. In general the Pecos River separates the occurrence of these two species. Apparently American botanists accepted the two species as one, and that one known as *E. antisyphilitica*. Botanists in Texas, having the opportunity of becoming familiar with both species, knew them to be distinct. From the limited descriptions in manuals it appeared that the species growing west of the Pecos River was really *E. antisyphilitica*.

In January, 1935, Dr. E. L. Reed of the Texas Technological College, Lubbock, Texas, published *E. texana*, as a species occurring somewhat infrequently on the High Plains of West Texas. His

description fits the species of *Ephedra* occurring on the Edwards Plateau and the Rio Grande Plains of Texas, and in great abundance in certain localities of these areas. Because of its wide distribution and its importance in range vegetation in certain localities it was thought that this species surely must have been described previously, hence an investigation was undertaken.

A loan of the Texas material in the National Herbarium was kindly granted to me. It was found that the reference by Coulter to the occurrence of *E. nevadensis* in Texas was based on early collections stated as coming from El Paso, which were sterile and could not be determined satisfactorily by any one not having field experience with the species growing in the State. The material from the National Herbarium merely confirmed the existing confusion concerning these species of Ephedra, and afforded no opportunity for settling the difficulty. It was necessary to learn definitely just which species was *E. antisyphilitica.* Dr. P. A. Munz, Pomona College, Claremont, California, in supplying me with material of *E. nevadensis,* called to my attention a paper devoted to the botany of the genus *Ephedra,* which was published in 1928 by Groff & Clark as University of California Publications in Botany, Vol. 14, No. 7. In this publication was found a detailed description of *E. antisyphilitica,* and this information settled positively that the species growing east of the Pecos River was the true species of that name. However, it was obvious that Groff & Clark knew nothing about the species west of the Pecos River which heretofore had been passing as *E. antisyphilitica.* This species therefore appears to be without a name. Inasmuch as this understanding relegates to synonymy Dr. Reed's *E. texana,* I take pleasure in naming our rather familiar species of *Ephedra* in his honor and in recognition of his studies of this group of plants.

Ephedra **Reedii**, sp. nov., frutex plerumque erectus, 0.5–1.5 m. altus; ramis plerumque 20 cm. vel ultra longis, diametro 0.5 cm. vel ultra, rigidis, subpatentibus, teretis, pallidis, fuscis vel griseis, cortice sublaeve vel aspero; ramulis ad 30 cm. longis, diametro ad 4 mm. in fasciculos paucos ad ramorum apices aggregatis, gracilibus, teretis, tenuiter striatis, scabris, flavido-viridibus; foliis binis, maturis 2 mm. vel minus longis ad ½ connatis, deinde deciduis, apice subfoliaceis obtusis; spicis masculis non visis; galbulis femineis 1-floris, oppositis, solitariis vel saepius 2–4 in capitella aggregatis, in pedicellis paleaceo-bracteatis minus quam 4 mm. longis gestis; galbuli maturi bracteis 2–4-jugis, late ovatis vel suborbicularibus, basi connatis, membranaceis, brunneis vel pallidis, margine scariosis; galbulis maturis non

carnosis, ad 9 mm. longis et 4 mm. latis; nuculis 6–7 mm. longis, 3 mm. vel minus latis, oblongo-ovoideis, basi rotundatis, ad apicem rotundatum vel complanatum angustatum versus obscure 3-angulatis, maturis plerumque ½ vel plus exsertis.

EPHEDRA **Reedii**, n. sp. Erect shrub or, when closely browsed, widely spreading, 0.5–1.5 m. high; branches mostly 20 cm. long or more, 0.5 cm. broad or more, stiff, somewhat divergent, terete, pale, dusky, or grayish, the bark somewhat smooth to very rough, fissured, or shreddy; branchlets mostly up to 30 cm. long and up to 4 mm. broad, in few to several clusters near the end of branches, giving an equisetum-like appearance to the branch, the active branchlets slender, terete, finely striate, scabrous, yellowish-green; leaf-scales 2-parted, the older ones 2 mm. long or less, connate for as much as half their height, the tips somewhat foliaceous, obtuse, the scales at length deciduous; staminate catkins not available; pistillate catkins 1-flowered, opposite, solitary or more frequently in heads of 2–4, on short, scaly-bracted pedicels, these less than 0.4 cm. long; bracts of fruiting cone 2–4 pairs, round-ovate to suborbicular, connate at base, membranous, brown to pale, scarious-margined; mature fruiting cone not fleshy, up to 9 mm. long and 4 mm. broad; nutlet 6–7 mm. long, 3 mm. broad or less, oblong-ovoid, rounded at the base, obscurely 3-angled towards the rounded or flattened, narrowed apex, usually half or more exserted at maturity.

Representative material: *Cory* No. 3730, U. S. Nat'l. Herb. No. 1,533,378, collected April 3, 1931, in Terrell County, Texas, about twenty miles northeast of Sanderson; No. 18547, collected April 13, 1936, in Brewster County, Texas, at about fifty-five miles south of Alpine on the road to Terlingua, TYPE in the Gray Herbarium; No. 18311, collected April 9, 1936, at Phantom Lake in Jeff Davis County, Texas, in Herbarium of the Arnold Arboretum.

This species differs from *E. nevadensis* in its connate, deciduous leaf-scales, in its membranous fruiting bracts that do not become fleshy and reddish at maturity, and in its nutlets being always solitary. From *E. antisyphilitica* it differs in that its branchlets usually are yellowish-green instead of pallid-green or glaucescent, and in its mature fruiting cones not becoming fleshy and reddish at maturity.

In examining considerable Texas material of *E. antisyphilitica* in mature fruit two extremes were noted. In one of these, the one commonly found, the nutlets are 7–7.5 mm. long and exserted, and thereby comply with the description of that species. The other form was characterized by a shorter and broader fruit with an included nutlet of different shape. This latter form was found in one collection from Bexar County and in one collection from Kent County, widely separated localities, which indicate that it grows with the species.

Our material does not indicate other differences or show intermediates, hence it would appear that a variety of the species should be recognized.

Ephedra antisyphilitica, var. **brachycarpa** var. nov., a varietate typica differt galbulis maturis brevioribus latioribusque, nuculis latioribus, trigonis, acutis, inclusis.—The type specimen, No. 12175, collected March 25, 1935, in eastern Bexar County, Texas, by Mr. H. B. Parks, is deposited in the U. S. National Herbarium.

This differs from the species in its shorter and broader mature fruiting cones, and in the nutlet being broader, trigonous, acute, and included.

The separation of the species and the variety may be indicated in the following manner:

species: mature fruiting cone more than 6 mm. long to the apex of the exserted nutlet; nutlet about 2.5 mm. broad, pyriform, the base rounded and not angled or only obscurely so, and somewhat 2-angled or 3-angled at the narrow, truncate, prominently exserted apex.

variety: mature fruiting cone less than 6 mm. long; nutlet about 3 mm. broad, trigonous, apex acute, included.

Sonora, Texas

Anaphalis margaritacea again.—In 1911, Professor Wiegand and I[1] pointed out that, besides the common plant of eastern North America with slender leaves arachnoid-tomentose above, which has universally passed as *Anaphalis margaritacea*, we have in northern and eastern New England, thence to the lower St. Lawrence and Newfoundland, the coarser var. *occidentalis* Greene, with broader dark-green and glabrous leaves continuing without marked reduction in size up to the inflorescence. Subsequently I designated a form of the slender-leaved and common eastern plant which has the leaves bright green and glabrous above as *forma anochlora* Fernald in Rhodora, xxiv. 205 (1922) and in 1925 I recognized[2] on the mountains of Quebec and Newfoundland and in other cool areas of the Northeast var. *subalpina* Gray.

During all this time the assumption first made by Greene, when he designated var. *occidentalis* in 1897, that the plant with the narrow and rapidly reduced leaves floccose-tomentose above is true *Anaphalis margaritacea*, was general, although Wiegand and I came within hailing distance of the truth when we noted that "the common

[1] Fernald & Wiegand, Rhodora, xiii. 25–27 (1911).
[2] Fernald, Mem. Am. Acad. xv. 284 (1925).

plant of northern Asia is var. *occidentalis* rather than typical *A. margaritacea*, as is the plant commonly cultivated and now somewhat naturalized in Europe. Since it is stated that the cultivated plant of Europe (var. *occidentalis*) was introduced from America 'about the sixteenth century,' it is probable that it was carried thence from Newfoundland or eastern Canada."[1]

As a matter of fact, true *Gnaphalium margaritaceum* L. Sp. Pl. 850 (1753) was var. *occidentalis*. Its primary type is the plant of Hortus Cliffortianus, the Linnean work from which its author took his diagnosis in 1753. A photograph of this type, recently received through Mr. Ramsbottom, is conclusive. The consistent references in Hortus Cliffortianus to descriptions of the plant in European gardens is equally so. In Species Plantarum the species was assigned "*Habitat in* America *septentrionali, Kamtschatica.*" It is, therefore, significant that the plant of Kamtchatka is all var. *occidentalis*.[2] For the slender-leaved plant with blades arachnoid- or flocculent-tomentose above I find no published name, though its extreme with leaves bright green and glabrous from the first, the plant I called *A. margaritacea*, forma *anochlora*, is var. *revoluta* Suksdorf in Allgem. Bot. Zeitschr. xii. 7 (1906). Suksdorf's isotype in the Gray Herbarium is clearly this plant, as is all the material of the narrow-leaved extreme from the Pacific Slope. The commonest plant of the East is

ANAPHALIS MARGARITACEA (L.) Gray, var. REVOLUTA Suksd., forma **arachnoidea,** forma nov., foliis supra arachnoideo-tomentosis. TYPE: dry bank, Coy Glen, Ithaca, New York, August 9, 1915, *L. H. MacDaniels* in Gray Herb.—M. L. FERNALD.

THE OCCURRENCE OF CENTIPEDA MINIMA IN WELLESLEY, MASSACHUSETTS.—During the summer of 1937 several scores of plants of *Centipeda minima* (L.) A. Br. and Aschers. were discovered growing among strawberry plants just outside the botany greenhouses of Wellesley College. Upon scrutinizing the specimens of this species at the Gray Herbarium I find no sheet from North America. The specimens in this herbarium were collected very largely in India, China, Japan, and various islands of the Pacific Ocean. I have not succeeded in locating any reference to this species in any of the current manuals or floras of the different sections of the United States. The

[1] Fernald & Wiegand, l. c. 26.
[2] Hultén, Fl. Kamtch. iv. 164 (1936).

first edition of Engler & Prantl's Die Natürlichen Pflanzenfamilien refers to this species, under the synonym *Centipeda orbicularis* Lour., as abundant in tropical Asia from Afghanistan eastwards, in Australia, and in Madagascar.

The plants growing at Wellesley (a small branching annual with tiny heads, suggesting those of *Tanacetum*, sessile in the axils of the cuneate leaves) resemble very closely the illustrations of this species cited under the name *Dichrocephala Schmidii* in tab. 1610 of Wight's Icones Plantarum Indiae Orientales. It is impossible to explain satisfactorily the occurrence of *Centipeda minima* at Wellesley. The seeds may have been present in litter that was used in covering the strawberry plants over winter, or in fertilizer applied to the plot of ground. It is very possible, however, that Miss Helen I. Davis, of the botany department of Wellesley College, returning from her trip around the world in 1934–'35 unwittingly brought in the seed. Miss Davis visited many of the regions where this species occurs. Inasmuch as the species is an annual it will be interesting to see if it appears again this coming summer.—Alice M. Ottley, Wellesley College.

Vernonia fasciculata Michx., var. **corymbosa** (Schwein.), comb. nov. *V. corymbosa* Schwein, in Keating, Narr. Exp. Long ii. 394 (1824). *V. Schweinitzii* Steud. Nom. ed II. ii. 755 (1841). *V. fasciculata corymbosa* Daniels Univ. Mo. Studies, Sci. ser. I. 403 (1907).

Study in the genus *Vernonia* has made clear the fact that *V. corymbosa* of Schweinitz should be treated as a variety of *V. fasciculata* Michx., as probably intended by Daniels. It is difficult, however, to know precisely what category Daniels did have in mind, when he published the trinomial *V. fasciculata corymbosa*. Since the combination is not in accordance with recommendation XXI under Article 45, Section 6 of the International Rules of Botanical Nomenclature, it seems best to publish a name validly at this time.—Bernice G. Schubert, Gray Herbarium.

Volume 40, no. 472, including pages 137–184, was issued 16 April, 1938.

JUN 8 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. June, 1938. No. 474.

CONTENTS:

Oscillatoriaceae of Southern Massachusetts. *Francis Drouet* 221

Western Extension of Range of Pinus Banksiana in New York. *W. F. Pratt and E. W. Litchfield* 241

New Triodia from Oklahoma. *H. I. Featherly* 243

Regulations Concerning the Gaspesian National Park 244

Further Notes on Verbena stricta, forma albiflora. *Harry V. Truman* 244

Northeastward Extensions in the Maine Flora—II. *George B. Rossbach* 245

Wherry's Guide to Ferns (Review). *C. A. Weatherby* 247

Extension of Range of Ranunculus Purshii. *Maynard W. Quimby* .. 248

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **June, 1938.** **No. 474.**

THE OSCILLATORIACEAE OF SOUTHERN MASSACHUSETTS[1]

FRANCIS DROUET

ALGAL works published during the past sixty-five years contain short lists of Oscillatoriaceae from southern Massachusetts,[2] the chief among which are those of Farlow, *Marine Algae of New England* (1891); Collins, RHODORA **2**: 41–52 (1900); Davis, Bull. U. S. Bur. Fish. 1911 (2): 795–833 (1913); Taylor and Hazen in Lewis, RHODORA **26**: 211–215 (1924); and Croasdale, *Fresh Water Algae of Woods Hole, Massachusetts* (1935). Other shorter papers are referred to in the list of species below. A small number of preserved specimens from the region has been distributed by Farlow, Anderson & Eaton in *Algae Am. Bor. Exsiccatae* and by Collins, Holden & Setchell in *Phycotheca Boreali-Americana.* These exsiccatae, the specimens upon which previous reports have been based, and other material cited in the present paper have come chiefly from the vicinity of Woods Hole. The freshwater algal habitats of this area are described by Fogg, RHODORA **32**: 147ff (1930), and by Croasdale, ibid.; the marine and brackish habitats by Davis, ibid. 1911 (1): 443–544 (1913), and by Taylor, *Marine Algae* (1937).

The comparative morphology of the group, first treated critically by Thuret, Ann. Sci. nat. VI Bot. **1**: 372–382 (1875), and further elaborated in a series of papers by Bornet, Thuret, Flahault, and Gomont, is summarized in a lucid manner in the introduction to

[1] Contribution from the Osborn Botanical Laboratory of Yale University and the Department of Botany, Marine Biological Laboratory.

[2] The Myxophyceae of Nantucket County will be treated in a separate publication and are therefore not referred to in the present paper. For a similar reason, the genus *Plectonema* Thur. ex Gom. is omitted here.

Gomont's 'Monographie des Oscillariées,'[1] Ann. Sci. nat. VII Bot. **15:** 263–368; **16:** 91–264 (1892). Recent work is reviewed by Geitler, Rabenh. Kryptogamen-Fl. **14** (1930–32). These authors make clear, among other things, that most species can be recognized with reasonable accuracy only when the organisms are found in non-hormogonial masses of considerable size and relatively pure state. Such determinable plant-masses, it is argued, develop only under certain limited combinations of physical, chemical, and biotic conditions; as these conditions change, the plant-mass may pass into the hormogonial state or disappear entirely. The determinable state may persist for a single day, or throughout a season, or even longer. The descriptions for taxonomic purposes will apply, therefore, only to the brief period of the life history during which the plant-mass is not in the hormogonial or dispersed states. In the species which he treated, Gomont attempted to define the limits of variation of each character during this determinable state: color and form of plant mass; color, diffluence, lamination, size, and reaction to chlor-zinc-iodine of the sheath; habit of the filaments and trichomes; shapes of apices of the trichomes; the degree of thickening of the outer wall of the apical cell; cell measurements; color and granulation of the protoplasm; and nature of the cross-walls. The recent literature contains frequent expressions of doubt as to the taxonomic importance of certain of the more variable characters referred to above. Such doubt in some cases may be well founded; in other cases it may be due to the lack of familiarity with the species concerned. It is to be regretted that these limits of variability have not yet been studied by pure culture methods; on the other hand, though such characters are generally regarded as extremely inconstant in other groups of plants and animals, I must confess myself unable except in rare instances to enlarge upon the limits of variability as described by Gomont.

For permanent preservation of the characters mentioned above, drying the material as quickly as possible without the aid of heat is recommended. The best preparations are secured when the material is reduced to the dried condition in the open air (in front of a shaded open window or electric fan) within an hour after it has been lifted from its habitat. In so drying, the shapes of the cells and even the protoplasmic characters of color and granulation are preserved.

[1] The International Botanical Congress of Vienna in 1905 established Gomont's 'Monographie' as the point of departure for nomenclature in the Homocystineae.

Mounts duplicated upon mica (or glass) and paper are to be preferred. Formalin, even in such low concentrations as 2% by volume in water, often produces granules and vacuoles not evident in the living protoplasm and seldom allows the original color of the plant mass or of the trichomes to be retained. If material preserved in formalin is dried in the preparation of herbarium specimens, such essential characters as size and shapes of cells are often sacrificed also, especially in the unsheathed forms. There are indications that preservation in liquid media affects the capacity of the sheath to react with chlor-zinc-iodine. Preserving fluids containing alcohol, acetic acid, glycerine, and salts of copper render most material valueless for taxonomic purposes.

For obvious reasons, citations of specimens in the list below have been restricted to herbarium material. The location of specimens in herbaria is indicated by means of the following abbreviations: D, my personal herbarium; F, Farlow Herbarium of Harvard University; Mo, Herbarium of the Missouri Botanical Garden; N, New York Botanical Garden; P, Herbarium of the University of Pennsylvania; S, Naturhistoriska Riksmuseet, Stockholm; T, Herbarium of Wm. Randolph Taylor; W, Herbarium of the Marine Biological Laboratory; Y, Herbarium of Yale University.

The keys presented here are admittedly cumbersome, but it is hoped that they will enable the worker to determine with accuracy whether or not his material can be placed in a species treated. I have not hesitated, wherever such a procedure seemed desirable, to incorporate literal translations of parts of original descriptions into the key. The term 'cell' is used throughout the paper as an English equivalent of Gomont's *articulum*, and 'cross-wall' an equivalent of Gomont's *dissepimentum*.

I am grateful to members of the staffs of the Osborn Botanical Laboratory, the Marine Biological Laboratory, the Farlow Herbarium, the New York Botanical Garden, and the Department of Botany of the University of Missouri for their generous cooperation during this work; to Prof. l'Abbé P. Frémy, Prof. L. Geitler, and Dr. G. Huber-Pestalozzi for comparing various specimens with authentic European material; to Prof. Wm. Randolph Taylor, Dr. Hannah T. Croasdale, Mr. Earl T. Rose, Prof. George J. Hollenberg, Prof. G. W. Prescott, Mr. C. M. Palmer, Mr. G. T. Velasquez, and many others cited as collectors of specimens here, who placed their collections at my dis-

posal and rendered numerous other courtesies; and to Prof. Taylor, Prof. A. W. Evans, and Prof. G. E. Nichols for suggestions concerning the manuscript during its preparation. Much of the work was pursued at Yale University with the aid of the Theresa Seessel Research Fellowship.

KEY TO GENERA

I. Trichomes more than one within the sheath; sheaths typically closed at the apices ..... Tribe I. VAGINARIEAE
A. Trichomes few (1–5, rarely more) and loosely aggregated within the sheath
1. Plant-mass aerial, subaerial, or submersed, compact, in some species impregnated with calcium carbonate or other foreign substances; sheaths hyaline or colored, in many species coloring blue when treated with chlor-zinc-iodine, definitely delimited, often lamellated, in most species not mucous; trichomes never capitate ..... *Schizothrix*
2. Plant-mass submersed or subaerial, mucous; sheaths always hyaline, never coloring blue when treated with chlor-zinc-iodine, broad and often conspicuously lamellated, often entirely diffluent; trichomes attenuate and truncate or capitate at the apices .... *Hydrocoleum*[1]
B. Trichomes numerous and closely aggregated within the sheath.—Plant-mass submersed, subaerial, or aerial, compact or gelatinous; sheaths always hyaline, in our species not coloring blue when treated with chlor-zinc-iodine, mucous and often entirely diffluent; trichomes rotund, attenuate, or calyptrate at the apices .... *Microcoleus*
II. Trichomes solitary within the sheath or without evident sheaths; sheaths not closed at the apices ..... Tribe II. LYNGBYEAE
A. Plant-mass sufficiently coherent (in most species) to remain intact when lifted from its habitat; trichomes surrounded by evident sheaths or amorphous jelly
1. Plant-mass characteristically submersed, rarely subaerial; sheaths definitely delimited, often lamellose, becoming mucous and diffluent only (if at all) in the hormogonial state ..... *Lyngbya*[2]
2. Plant-mass aerial or subaerial, the interwoven and contorted filaments forming a compact stratum, from the surface of which arise upright or repent bundles of filaments; sheaths in the stratum distinct and never confluent, in the fascicles often mucous and confluent; trichomes never capitate with an enlarged apical cell, in some species calyptrate ..... *Symploca*[3]

[1] Species of Hydrocoleum, especially the marine forms, are often misplaced in the genera Symploca, Phormidium, and Oscillatoria.

[2] *Symploca Muscorum* and *Phormidium ambiguum*, when growing submersed, often produce distinctly lyngbyoid masses. Species of Plectonema, Scytonema, Tolypothrix, and Hapalosiphon, observed in unbranched or anheterocystous states, have often been confused with species of Lyngbya.

[3] If submersed, the plant-mass is a compact stratum or gelatinous mass of contorted filaments the sheaths of which are definitely delimited and seldom mucous. *Lyngbya aestuarii* when growing subaerially often produces upright fascicles from the stratum (f. *symplocoidea* Gom.). Species of Schizothrix, Fischerella, Scytonema, Tolypothrix, and Hapalosiphon produce similar fascicles under subaerial conditions.

3. Plant-mass submersed, subaerial, or in a few species aerial, compact; sheaths characteristically partially or wholly confluent into an amorphous jelly which in some species is impregnated with calcium carbonate or other foreign matter; trichomes not more than 12 μ in diameter, in several of the more common species capitate with an enlarged apical cell . . . . . *Phormidium*

B. Plant-mass mucous, rarely remaining intact when lifted from its habitat, submersed or subaerial; trichomes without evident sheaths or amorphous jelly

1. Trichomes not regularly and permanently spiraled throughout their entire lengths, always articulated (cross-walls evident without the application of stains or reagents), in many species straight, or variously curved and contorted, or spiraled at or for a short distance behind the apices . . . . . *Oscillatoria*
2. Trichomes more or less regularly and permanently spiraled throughout their entire lengths, conspicuously articulated, not evidently so, or not at all . . . . . *Spirulina*

Vaginarieae

Gom. ex Ann. Sci. nat. VII Bot. **15**: 290 (1892).

SCHIZOTHRIX Kütz. ex Gom., ibid. 292 (1892). *Hyphcothrix* Kütz. ex Kirchn., Schizophyc. 67 (1900). *Symplocastrum* (Gom.) Kirchn., ibid. 68 (1900). *Inactis* Kütz. ex Kirchn., loc. cit. (1900).—The four subgenera are separated from each other according to the habit of the plant masses and the color of the sheaths. No specimens of the subgen. *Inactis* Gom. have appeared in the collections examined. It is to be expected that further collecting will discover a number of as yet unreported species of Schizothrix in the southern Massachusetts flora.

Key to Species

I. Small plants, aquatic, subaerial, or aerial, with prostrate habit of growth, filaments in which false branching is not common, and hyaline sheaths . . . . . Subgenus I. Hypheothrix (Kütz.) Gom. ex Ann. Sci. nat. VII Bot. **15**: 306 (1892).

Stratum almost fragile, blue-green, never incrusted with lime; filaments closely interwoven, lower portions unbranched and straight, upper portions falsely branched, the branches tortuous in habit; sheaths usually firm, erose at the margins, acuminate at the apices, in the lower portions wide and lamellose, coloring blue when treated with chlor-zinc-iodine; trichomes few within the sheaths, often single in the false branches, 1.5–3 μ in diameter, constricted at the cross-walls; cells up to 5 μ long; apical cell acute-conical . . . . . *S. arenaria*

II. Subaerial or aerial plants with filaments ascending in erect symplocoid fascicles from a prostrate stratum, the sheaths always hyaline . . . . . Subgenus II. Symplocastrum Gom., ibid. 314 (1892).

Stratum indefinitely expanded, blackish or olive-green; filaments in the basal stratum tortuous and intermeshed, in the fascicles more or less straight, erect, parallel, dichotomously and appressedly false-branched; fascicles rigid, spiniform, erect, to 3 cm. or more high; sheaths

cylindrical, firm, lamellose, erose or smooth on the margins, acuminate at the apices, coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, few or solitary within the sheath, parallel, evidently constricted at the cross-walls, 3–6 μ in diameter; cells subquadrate to twice as long as wide, 4–11 μ long; protoplasm coarsely granular; apical cell truncate-conical ..... *S. Friesii*

III. Plant mass terrestrial or rarely aquatic, a prostrate stratum from which, in several species, arise erect or repent symplocoid fascicles; sheaths of mature filaments colored ..... Subgenus III. CHROMOSIPHON Gom., ibid. 318 (1892).

Stratum indefinitely expanded, dark violet or brownish; filaments more or less elongate, subdichotomously and falsely branched, the branches divaricate, much contorted below, more or less parallel and agglutinated into tortuous repent fascicles above; sheaths brown- or purplish-red, with acuminate hyaline apices, firm, very wide and conspicuously lamellose, irregular or erose on the margins, coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, often more or less numerous within the sheath, in most collections constricted at the cross-walls, 6–8 μ in diameter; cells subquadrate to twice as long as wide; protoplasm coarsely granulose in all except the apical cell; apical cell conical, often very acutely so ..... *S. purpurascens*

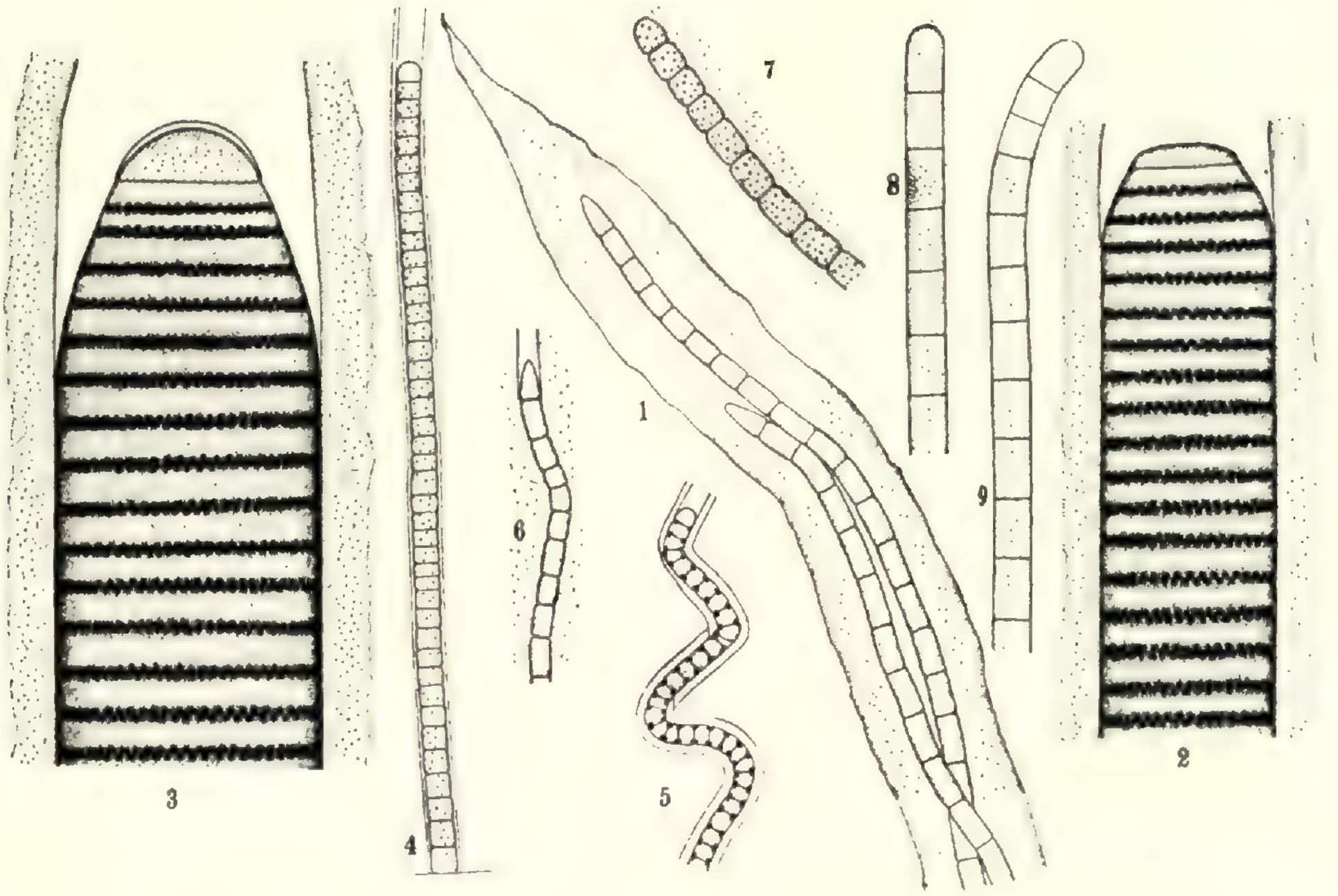
SCHIZOTHRIX ARENARIA (Berk.) Gom., Ann. Sci. nat. VII Bot. **15**: 312, pl. viii, f. 11, 12 (1892). *S. Friesii* of Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935), in part, not Gom.—*Fig. 1.* This is an apparently frequent alga of denuded soil. Smith in *Fresh-water Algae of the United States* (1933) does not cite the species for the United States, though Gomont, ibid. 313, mentions a specimen collected by Setchell in this country. Specimens seen: FALMOUTH: on denuded ground at south end of Park Street, Woods Hole, *Drouet 1929*, 25 Aug. 1936 (D, F, S, T, Y); clay bank near entrance to Gansett Estate, Woods Hole, *Drouet 1217*, 5 Aug. 1934 (D, W); on clay bank, side of road to Quisset, *G. T. Moore*, 20 July 1898 (W).

SCHIZOTHRIX FRIESII (Ag.) Gom., Ann. Sci. nat. VII Bot. **15**: 316, pl. ix, f. 1, 2 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935), in part. *S. Purcellii* W. R. Taylor,[1] Proc. Acad. Nat. Sci. Phila. **80**: 91, pl. 12, f. 7–9 (1928). *Symplocastrum Brittoniae* Gardn.,[2]

[1] I interpret the TYPE of this species in the Herb. W. R. Taylor, BRITISH COLUMBIA: red surface mud from nearly dried pool, parkland, Cañon Creek near Golden, *W. R. Taylor*, 2 Sept. 1923, as the juvenile state of *S. Friesii*. The typical symplocoid habit is not developed, but the filaments differ in no other respect from the authentic material of *S. Friesii* cited here.

[2] A study of the TYPE in the Herb. New York Bot. Gard. and an ISOTYPE in my own herbarium, PUERTO RICO: summit of El Yunque, Catalina-Yunque Trail, Luquillo Mountains, *E. G. Britton 7648*, 23–26 Feb. 1923, shows that, in spite of word to the contrary in the original description, the apical cells are conical and the sheaths are laminose, as in the authentic Gomontian specimens of *S. Friesii* cited here. On the average, in a large number of trichomes seen, the cells are no longer than those seen in *S. Friesii*. The errors in the description apparently arose from the poor state of preservation of many trichomes in the upper portions of the fascicles.

New York Acad. Sci., Sci. Surv. Porto Rico **8**(2): 287, pl. 2, f. 11 (1932). Authentic material: Desmaz., Pl. cryptog. France, éd. I, 1971 (F); Rabenh. Alg. 394 (F), 492 (T), 2364 (T), 2445 (T).—Infre-



quently encountered on soil and mosses in shady woods and along paths. Two specimens: FALMOUTH: Fay's Woods, Woods Hole, *W. G. Farlow*, July 1889 (F); earth by roadside, Nobska Woods, *J. E. Humphrey*, 22 July 1896 (W).

SCHIZOTHRIX PURPURASCENS (Kütz.) Gom., Ann. Sci. nat. VII Bot. **15**: 320, pl. ix, f. 6–8 (1892). Authentic material: Rabenh. Alg. 851 (N).—Two collections, the var. CRUENTA (Lespin.) Gom., ibid. 321: FALMOUTH: Town Playground, Woods Hole, *Drouet 2173*, 30 Aug. 1937 (D, S). TISBURY: subaerial in a springy meadow at upper end of Lake Tashmoo, *Drouet 1902*, 21 July 1936 (D, F, S, T, Y).

HYDROCOLEUM Kütz. ex Gom., Ann. Sci. nat. VII Bot. **15**: 332 (1892). *Hydrocoleus* Forti, Syll. Myxophyc. 315 (1907); Tilden, Minn. Alg. **1**: 134 (1910); Geitler, Rabenh. Kryptogamen-Fl. **14**: 1146 (1932). —Though Kützing, *Phycologia generalis*, 196 (1843), originally proposed this genus as Hydrocoleum and his orthography has been perpetuated by its use in Gomont's 'Monographie,' the masculine form of the name as written by Forti has been continued in no small part of the recent literature. The forms here considered are all marine plants of rather large dimensions. No specimens of freshwater species from southern Massachusetts have yet been seen.

KEY TO SPECIES

I. Plant-mass epiphytic on larger marine algae or growing on rocks in quiet salt water; trichomes usually less than 15 μ in diameter.—Plant-mass greenish or almost black, slimy, in mucous clumps on larger marine algae or in gelatinous strata on rocks; filaments parallel, often falsely branched; sheaths broad, mucous, acuminate or open at the apices, under certain conditions entirely diffluent; trichomes yellowish-green or blue-green, many within the sheath at the base of the filament, few in the branches, not constricted at the cross-walls, 8–16 (usually 9–11) μ in diameter; cells 1/3–1/6 as long as wide, 2.5–4.5 μ long; cross-walls granulated; apex of trichome attenuate-truncate. . *H. lyngbyaceum*

II. Plant-mass subaerial or aquatic, usually in brackish or quiet salt water; trichomes more than 15 μ in diameter.

A. Plant-mass brownish or greenish, forming gelatinous expansions on floating algae or subaerial on sand or other algae; sheaths very mucous, often entirely diffluent; trichomes pale green or brownish, not constricted at the cross-walls, 14–21 (usually 17–19) μ in diameter; cells 1/3–1/6 as long as wide; cross-walls granulated; apex of trichome briefly attenuate-truncate. . . . . *H. glutinosum*

B. Plant-mass brownish or blackish, phormidioid, mucous, or in drying almost chartaceous, indefinitely expanded, never caespitose, usually covering floating algae or aquatic plants in brackish water, sometimes subaerial; sheaths at first subamorphous, hyaline, thin, soon entirely diffluent; trichomes brownish or blue-green, not constricted at the cross-walls, 24–35 (usually 25–30) μ in diameter; cells 1/5–1/8 as long as wide; cross-walls granulated; apex of trichome briefly attenuated, the apical cell bearing a hemispherical calyptra. . . . . *H. Holdenii*

HYDROCOLEUM LYNGBYACEUM Kütz. ex Gom., Ann. Sci. nat. VII Bot. **15**: 337, pl. xii, f. 8, 9, 10 (1892); Setchell, Erythea **4**: 89 (1896), Phyc. Bor-Amer. **5**: 204 (1896); Collins, RHODORA **2**: 42 (1900); Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913); Tilden, Minn. Alg. **1**: 136 (1910). Authentic material: Crouan, Alg. mar. Finistère **3**: 325 (F).—The typical variety occurs as greenish or blackish gelatinous masses on Ascophyllum, etc. in quiet salt water. Specimens seen: FALMOUTH: on Ascophyllum, Ram Island flats, Woods Hole, *M. Poole*, 17 Aug. 1936 (D, F, S, T, Y); Penzance Point, Woods Hole, *W. A. Setchell & W. J. V. Osterhout*, 30 Aug. 1894 (W); Woods Hole, *I. Holden*, 18 Aug. 1894 (F); on *Ascophyllum nodosum*, Wood's Hole, *W. A. Setchell*, 14 Aug. 1904 (Phyc. Bor.-Amer. 204, W, T, Y). GOSNOLD: south shore of Penikese Island, *J. G. Poole & Drouet*, 7 July 1930 (D).

HYDROCOLEUM GLUTINOSUM (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **15**: 339 (1892); Collins, RHODORA **2**: 42 (1900); Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913). *Lyngbya nigrescens* var. *major* Farlow, Mar. Alg. New Engl, 35 (1891), Alg. Am. Bor. Exs. **1**: 47. *L. aestuarii* f. *limicola* of Collins, Phyc. Bor.-Amer. **29**: 1402 (1907), in certain specimens, not Gom. *Oscillatoria margaritifera* of Taylor and Hazen

in Lewis, RHODORA **26**: 212, 215 (1924), in part, not Kütz. ex Gom. Authentic material: Crouan, Alg. mar. Finistère **3**: 328 (F).—*Fig. 2.* The typical variety is commonly found in blackish-green or brown sheets on sand or on algae floating in quiet salt or brackish water. This species and the next are often confused with *Oscillatoria margaritifera* and *O. Bonnemaisonii*, which they resemble superficially. Phyc. Bor.-Amer. 1402 is represented in the Herbarium of Yale University by an excellent specimen of *H. glutinosum*, and in the Herbarium of the Marine Biological Laboratory by typical *Lyngbya aestuarii*. Specimens seen: EASTHAM: on mud of a salt marsh, Bay shore, *F. S. Collins*, 10 Aug. 1897 (Phyc. Bor.-Amer. 1402, Y [not W]). FALMOUTH: on Vaucheria floating in Gardiner's Ditch, Woods Hole, *Drouet 1917*, 17 Aug. 1936 (D, F, S, T, Y); Wood's Holl, *W. G. Farlow*, 1875 (N); ad Zosteram et algas mortuas, Wood's Holl (Alg. Am. Bor. Exs. 47, F, Y); Gardiner's Ditch, Woods Hole, *Anon.*, 15 July 1931 (W); West Falmouth, *F. S. Collins* (F); in masses of dead floating Zostera and algae, Woods Hole, *W. G. Farlow*, Aug. 1875 (F). GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W).

HYDROCOLEUM HOLDENII Tilden, **descr. emend.** *H. Holdenii* Tilden, RHODORA **3**: 254 (1901); Minn. Alg. **1**: 137 (1910); Forti, Syll. Myxophyc. 319 (1907); Geitler, Rabenh. Kryptogamen-Fl. **14**: 1147 (1932). *H. majus* Holden, RHODORA **1**: 197, pl. 9, f. 7, 8 (1899), Phyc. Bor.-Amer. **13**: 602 (1899); Collins, RHODORA **2**: 42 (1900); not Martens. *Oscillatoria margaritifera* of Collins, Phyc. Bor.-Amer. 1708a, b (1911), not Kütz. ex Gom. *O. Bonnemaisonii* of Collins, ibid. 1707e (1911), not Crouan ex Gom. Stratum luteo-fuscum vel nigro-viride, phormidioideum, mucosum aut siccante fere papyraceo-chartaceum, indefinite expansum, haud caespitosum, vulgo algas majores et alias plantas aquaticas tectans, nonnumquam ad littora arenosa intra limites fluctuum maris subaeriale; vaginis initio subamorphis, hyalinis, plus minusve tenuibus, demum omnino diffluentibus, chlorozincico iodurato haud caerulescentibus; trichomatibus vivis luteo-fuscis vel aerugineis, ad genicula non constrictis, 24 μ ad 35 μ (vulgo 25 μ ad 30 μ) crassis, intra vaginas singulis binisve; articulis diametro trichomatis quintuplo ad octuplo brevioribus, 3.5 μ ad 4.5 μ longis; protoplasmate granuloso, dissepimentis grosse-granulatis; apice trichomatis breviter et leviter attenuata; cellula apicali calyptram hemisphaericam praebente (v. s., v. v.). *Fig. 3.*—In quiet brackish or salt water along the coast of New England. Specimens seen: MASSACHUSETTS: Eastham: in marshes, *F. S. Collins*, 13 July 1907 (Phyc. Bor.-Amer. 1708a, b, *specim. manca*, W, T, Y); among Calothrix, etc. in a salt marsh, *F. S. Collins*, July 1909 (Phyc. Bor.-Amer. 1707e, *specim. mancum*, W, T, Y). Falmouth: floating in a salt marsh at east side of Eel Pond, Woods Hole, *Drouet 1927*, 24 Aug. 1936 (D, F, S, T, Y); Gardiner's Ditch, Woods Hole, *Drouet 1946*, 17 Sept. 1936 (D, F). CONNECTICUT: on old Spartina stems in ditches of a salt marsh, Bridgeport, *I. Holden*, 24 May 1896 (Phyc. Bor.-Amer.

602, N, T, W, Y); Cook's Point, Bridgeport, *I. Holden*, 30 May 1896 (TYPE of *H. majus* Holden in Farlow Herb.). NEW YORK: on algae in pool in salt marsh, Cold Spring Harbor, *L. N. Johnson 1089*, July 1895 (F).

Doubts concerning the validity of this species have been raised by Geitler (ibid.). The material distributed by Holden in Phyc. Bor.-Amer. 602 is composed of badly shriveled trichomes which are often conspicuously torulose, a result, apparently, of the method of preparation of the exsiccata. The figure accompanying Holden's original description of *H. majus* must have been drawn from such dried material, since it is considerably at variance with the description. The type material in the Farlow Herbarium, however, contains few such shriveled trichomes and matches the written description exactly. This material, according to the herbarium label, grew in a salt marsh about the culms of Spartina, so that the stratum was apparently 'pierced' by these culms and became tubular (Geitler's 'röhrig') when the water level was lowered. Similar tubular growths are produced by this alga on Spartina culms during the dry season (when the water level is lowered by evaporation) in Gardiner's Ditch, a brackish marsh at Woods Hole. In the type material as well as in that of my own collecting, the range in size of trichomes is somewhat greater than that described by Holden. By actual experimentation I find that the trichomes, if dried very rapidly, retain the exact measurements characteristic of them in the living condition, despite Prof. Geitler's suggestion that in the material distributed in Phyc. Bor.-Amer. 602 "dieser Wert dürfte in Vergleich zur Breite des turgeszenten, kreisrunden Trichoms zu hoch sein." The trichomes referred to species of Oscillatoria in Phyc. Bor.-Amer. 1707e and 1708a & b are sheathed forms rather miserably preserved; though the plant-masses are in a very juvenile state, I cannot refer them to other than this species. *H. Holdenii*, like *H. glutinosum*, is a form with extremely diffluent sheaths inhabiting chiefly brackish water or muddy and sandy shores in the intertidal zone. From the latter species it differs in its greater trichomatal dimensions and in the presence of a hemispherical thickening of the outer wall of the apical cell.

MICROCOLEUS Desmaz. ex Gom., Ann. Sci. nat. VII Bot. **15**: 350 (1892).—I regret that I cannot admit to this list two species often encountered in fresh water in North America: *M. paludosus* (Kütz.) Gom. and *M. lacustris* Farl. ex Gom. Croasdale's reports of these in her *Fresh Water Alg. Woods Hole, Mass.*, 21 (1935), cannot be based

upon other than *M. chthonoplastes*, since the material was collected in brackish water of Gardiner's Ditch, Woods Hole; her specimens have been misplaced.

KEY TO SPECIES

I. Plant-mass subaerial or aquatic in brackish or salt water, rarely if ever in strictly fresh water; trichomes attenuate, conical or acuminate at the apices, never capitate
  A. Plant-mass yellowish or blackish-green, an extended stratified layer in or about brackish ponds or salt marshes; sheaths mucous, often entirely diffluent; trichomes bright blue-green, closely aggregated and numerous within the sheath, 2.5–6 μ in diameter, constricted at the cross-walls; cells subquadrate to twice as long as wide; cross-walls often granulated; apical cell acute-conical ..... *M. chthonoplastes*
  B. Plant-mass gray-green, or filaments mixed with other algae, usually in intertidal zones, seldom in brackish water; sheaths ample and mucous, often entirely diffluent; trichomes olive-green, more or less numerous within the sheath, conspicuously constricted at the cross-walls, 1.5–2 μ in diameter; cells 2.2–6 μ long; cross-walls pellucid, not rarely granulated; apical cell long-attenuate and very acutely conical ..... *M. tenerrimus*

II. Filaments subaerial or aerial on damp soil, rarely forming a black, tough, compact stratum; sheaths cylindrical, often entirely diffluent; trichomes green or olive-green, numerous and closely aggregated within the sheath, straight when escaped from the sheath, not at all constricted at the cross-walls, long-attenuate and capitate at the apices, 3.5–7 μ in diameter; cells subquadrate or half as long as wide, 3–7 μ long; cross-walls usually granulated; apical cell bearing a depressed-conical calyptra ..... *M. vaginatus*
Trichomes 4.4–6.5 μ in diameter, cells subquadrate or half as long as wide ..... var. *Vaucheri*

MICROCOLEUS CHTHONOPLASTES (Fl. dan.) Thur. ex Gom., Ann. Sci. nat. VII Bot. **15**: 353, pl. xiv, f. 5–8 (1892); Farlow, Alg. Am. Bor. Exs. **5**: 227 (1889), Mar. Alg. New Engl., 33 (1891); Collins, RHODORA **2**: 42 (1900); Tilden, Minn. Alg. **1**: 156 (1910); Davis, Bull. U. S. Bur. Fish. 1911 (2): 797 (1913). *Oscillatoria subtorulosa* of Davis, loc. cit. (1913), not Farl. apud Tild. *?M. lacustris* of Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935), not Farl. ex Gom. *?M. paludosus* of Croasdale, loc. cit. (1935), not Gom. Authentic material: Farl., Anders. & Eat., Alg. Am. Bor. Exs. 227 (F, Y).—Subaerial on intertidal flats and borders of salt marshes, often in masses of algae floating in brackish water, seldom and only accidentally in fresh water. Specimens seen: BOURNE: Red Brook, Pocasset, *H. Croasdale*, 12 Sept. 1934 (D). FALMOUTH: Penzance salt marsh, Woods Hole, *Drouet 1174* (D, F, S, T, Y), *1175* (D), 13 July 1934; Penzance Point, Woods Hole, *W. J. V. Osterhout*, 17 July 1895 (W, T); Wood's Holl, Aug. 1877 (F); Gardiner's Road Pond, Woods Hole, *W. R. Taylor*, 8 July 1917 (T); on mud, salt marshes, Woods Hole, *W. A. Setchell 816*, 16 Aug. 1894 (N); Wood's Holl, *W. G. Farlow*, Aug. 1877 (Alg. Am. Bor. Exs. 227,

F, Y); Falmouth, *F. S. Collins*, July 1880 (N); Shingle Pond, Gansett, *W. R. Taylor*, 30 June 1922 (T). GOSNOLD: salt marsh, Pasque Island, *C—C. Jao*, 26 June 1934 (D); salt marsh flats, e. end of Pasque Island, *W. R. Taylor*, 5 July 1932 (T, D).

MICROCOLEUS TENERRIMUS Gom., Ann. Sci. nat. VII Bot. **15**: 355, pl. xiv, f. 9–11 (1892); Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913). *Oscillatoria amphibia* of Davis, ibid. 798 (1913), not Ag. ex Gom. Authentic material: Wittr. & Nordst., Alg. exs. 696 (F).—This species has apparently remained unrecognized by collectors because it is so seldom seen in pure strata; often it passes in American herbaria under the name of *Oscillatoria amphibia*. It has been reported from Maine by Collins, RHODORA **5**: 233 (1903); but Frémy, in a resume of the geographic distribution of the species in Bull. Soc. Linn. Normandie sér. 7, **7**: 181ff (1924), does not include the eastern coast of North America within its range. In the vicinity of Woods Hole, one finds the species sparingly among other subaerial Myxophyceae in salt marshes, on intertidal zones of shores, pilings, walls, etc. Specimens seen: FALMOUTH: subaerial on Grassy Island, Woods Hole, *Drouet 1886*, 17 July 1936 (D, F, S, T, Y, Frémy); pilings at entrance of Eel Pond, Woods Hole, *M. Thurlow*, 17 July 1936 (D); on woodwork, Woods Hole, *F. S. Collins*, 16 Aug. 1904 (sub. nom. *Oscillatoria amphibia*, N).

MICROCOLEUS VAGINATUS (Vauch.) Gom. var. VAUCHERI (Kütz.) Gom., Ann. Sci. nat. VII Bot. **15**: 356, pl. xiv, f. 12 (1892). Authentic material: Erbar. critt. ital. **10**: 485 (F); Rabenh. Alg. 353 (F).—Often encountered on soil and not seldom appearing in soil cultures. Dispersed trichomes found in soil samples have been mistaken for those of *Phormidium autumnale*. Specimens seen: FALMOUTH: on sandy bank by Quisset Avenue north of Golf Course, Woods Hole, *Drouet 1907*, 5 Aug. 1936 (D, F, T). TISBURY: on lawn about pumping station at Tashmoo Spring, *G. Velasquez & Drouet 1895*, 21 July 1936 (D, F, S, T, Y).

LYNGBYEAE

Kütz. emend. Gom., Ann. Sci. nat. VII Bot. 16: 91 (1892).

LYNGBYA Ag. ex Gom., idem, 118 (1892).—The inconstancy of the generic characters in the Oscillatoriaceae during the period of formation and development of hormogonia is well illustrated in many collections of species of Lyngbya. The tenacity of the sheath material in this genus is often so great that developing hormogonia in the lower parts of the sheath are observed to exert much pressure upon the cells of neighboring hormogonia and to produce in them a variety of anomalous shapes; in many instances, they grow in such a manner as to lie side by side and parallel with each other within the sheath, thus producing the habit of one of the Vaginarieae. In other cases, such great pressure may be exerted that a hormogonium may burst through the sheath and produce the effect of false branching in the filament as in the genus Plectonema.

KEY TO SPECIES

I. Filaments attached by a basal end to the substratum and usually growing perpendicular to it.—Filaments solitary, almost straight or subflexuous, epiphytic on other algae in brackish water; sheaths very thin, hyaline, not at all (or in our material, not readily) coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, in our material somewhat constricted at the cross-walls, 1.8–2.8 μ in diameter, neither attenuate nor capitate at the apices; cells subquadrate or shorter than wide, 1–3 μ long; protoplasm coarsely granulose; cross-walls conspicuous, pellucid, not granulated; apical cell rotund, its outer membrane not at all thickened ..... *L. infixa*

II. Filaments attached to the substratum laterally, often throughout the entire length of the sheath.—Twining about other filamentous algae, principally in fresh water; filaments 1.5–2 μ in diameter; sheath thin, hyaline, not coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, 1–1.5 μ in diameter, not constricted at the cross-walls, not attenuate at the apices; cells 1–2 μ long; protoplasm homogeneous; cross-walls not granulated; apical cell rotund ..... *L. epiphytica*

III. Filaments usually unattached to a substratum, or attached laterally by a portion of the sheath

A. Plants of marine or brackish water, not or rarely found in strictly fresh water

1. Trichomes 2 μ in diameter.—Filaments mixed with other algae in brackish water, usually short, more or less regularly spiraled, or often straight; sheaths thin, hyaline, coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, about 2 μ in diameter, somewhat constricted at the cross-walls; cells 1.2–3 μ long; protoplasm finely granulose; cross-walls marked with two protoplasmic granules; apical cell rotund ..... *L. Lagerheimii*

2. Trichomes more than 2 μ in diameter

a. Sheaths not coloring blue when treated with chlor-zinc-iodine

(I) At least the older sheaths yellowish-brown.—Stratum brown or blue-green, subaerial or floating, sometimes forming symplocoid fascicles; sheaths at first hyaline, later colored yellowish-brown, often very thick and lamellose; trichomes blue-green or olive, at the apices often slightly attenuate-capitate and truncate, not constricted at the cross-walls, 8–24 μ in diameter; cells 1/3–1/6 as long as wide; protoplasm finely granulose; cross-walls granulated; outer membrane of apical cell conspicuously thickened ..... *L. aestuarii*

(II) Sheaths always hyaline

(A) Plant-mass extensive, dark blue-green, dull green, or yellowish-green; filaments crisp, elongate, variously intermeshed; sheaths very thick, to 11 μ wide, sometimes lamellose; trichomes blue-green, brownish, or grayish-green, not constricted at the cross-walls, not attenu-

ated at the apices, 16–60 μ in diameter; cells 1/6–1/15 as long as wide; protoplasm finely granulose; cross-walls never granulated; apical cell rotund, without calyptra.....*L. majuscula*

(B) Plant-mass expanded, slimy, brownish, dark green, or blackish, usually with a violet tinge in drying, or forming a pannose stratum; filaments elongate, straight, subrigid; sheaths lamellose, to 5 μ thick; trichomes olive or blue-green, often violet in dried material, not constricted at the cross-walls, not attenuated at the apices, 9–25 (in our material 9–12) μ in diameter; cells 1/3–1/8 as long as wide; protoplasm finely granulose; cross-walls granulated; apical cell rotund, without a calyptra.....*L. confervoides*

(C) Plant-mass expanded, mucous, usually dull yellow-green or obscurely blue-green, sometimes forming a pannose stratum; filaments not rigid or straight, always flexuous; sheaths lamellose, to 3 μ thick; trichomes yellowish-green, olive, or blue-green, somewhat attenuate and capitate at the apices, not constricted at the cross-walls, 5–12 μ in diameter; cells 1/3–1/6 as long as wide; protoplasm finely granulose; cross-walls frequently granulated; membrane of the apical cell thickened into a distinct depressed-conical or rotund calyptra...*L. semiplena*

b. Sheaths coloring blue when treated with chlor-zinc-iodine.—Stratum subgelatinous, coriaceous, yellowish-brown or olive, in drying often dark violet; filaments contorted, much intertwined; sheaths hyaline, at first thin, later to 3 μ thick and lamellose; trichomes olive-green, not constricted at the cross-walls, not attenuated at the apices, 2.5–6 μ in diameter; cells quadrate to 1/3 as long as wide; protoplasm granulose; cross-walls conspicuous, sometimes granulated; membrane of the apical cell thickened into a rotund calyptra.....*L. lutea*

B. Plants of fresh water exclusively.—Plant-mass a fragile, scarcely gelatinous stratum, intensely yellowish-brown; filaments short, stiff, more or less curved; sheaths at first thin and hyaline, later thick and opaque-brown, not coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, often torulose, 0.9 μ in diameter; cells shorter than wide, 0.6–0.8 μ long; cross-walls not granulated; apical cell rotund....*L. ochracea*

LYNGBYA INFIXA Frémy, Compt. Rend. Acad. Sci. Paris **195**: 1414 (1932); Mém. Soc. nat. Sci. nat. & math. Cherbourg **41**: 110, pl. 30, f. 1 (1934).—*Fig. 4.* I place the material cited below[1] in this species

[1] I cannot but suspect that this material should more properly be considered the juvenile form of *L. Digueti* Gom. in Hariot, Journ. de Bot. **9**: 169 (1895), as repre-

at the suggestion of Prof. Frémy, even though the sheaths become definitely blue when treated with chlor-zinc-iodine and the trichomes are slightly constricted at the cross-walls. These characters are not preserved well in my collections *1126* and *1134* cited below because the greater number of specimens were prepared for distribution from material immersed for more than a year in 2% formalin. Specimens seen: GOSNOLD: in a boggy salt marsh on north shore of Pasque Island, *Drouet 1126*, 26 June 1934 (D); on Cladophora, Pasque Island, *Drouet 1132*, 26 June 1934 (D, F, T, W, Y). OAK BLUFFS: growing on Cladophora, Cottage City, *F. S. Collins*, 19 Sept. 1883 (sub. nom *Leibleinia* sp., N).

LYNGBYA EPIPHYTICA Hieron. apud Lemmermann, Ark. f. Bot. **2**(2): 103 (1904); Forti, Syll. Myxophyc., 289 (1907). Hieron. *nomen subnudum* in Kirchn., Schizophyc., 67 (1900);—Epiphytic on freshwater algae, especially upon large sheathed Hormogoneales. Specimens seen: FALMOUTH: on *Dichothrix* sp. on a submerged piece of tile, Salt Pond, *E. T. Rose*, 19 June 1936 (D); on *Scytonema* sp., Silver Beach Pond, West Falmouth, *H. Croasdale*, 1 Sept. 1933 (D, F, T).

LYNGBYA LAGERHEIMII (Möb.) Gom., Ann. Sci. nat. VII Bot. **16**: 147, pl. iv, f. 6, 7 (1892); Setchell, Bull. Torr. Bot. Club **22**: 430 (1895); Tilden, Minn. Alg. **1**: 111 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); Croasdale, Freshwater Alg. Woods Hole, Mass., 20 (1935). —*Fig. 5.* Usually found in muck on the bottoms of subsaline ponds, often mixed with other algae. Filaments are not abundant in any of the specimens examined:[1] FALMOUTH: in a slightly brackish marsh about Chara Pond, *Drouet 1860*, 20 June 1936 (D); in brackish water, Little Pond, *W. A. Setchell & W. J. V. Osterhout*, 17 Aug. 1895 (W). GOSNOLD: Dune Pond, Nashawena Island, *Drouet 1167*, 3 July 1934 (D).

LYNGBYA AESTUARII (Mert.) Liebm. ex Gom., Ann. Sci. nat. VII Bot. **16**: 127, pl. iii, f. 1, 2 (1892); Farlow, Mar. Alg. New Engl., 34 (1891); Collins, RHODORA **2**: 42 (1900), Phyc. Bor.-Amer. **21**: 1009 (1903), ibid. **29**: 1402 (1907), in certain specimens; Tilden, Minn. Alg. **1**: 121 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); Taylor in Lewis, RHODORA **26**: 212 (1924); Hazen in Lewis, RHODORA **26**: 215 (1924); Croasdale, Fresh Water Alg. Woods Hole, Mass., 21

---

sented in Wittrock & Nordstedt, *Algae Exsiccatae* 1522a and b from Sweden. This species is described in the Myxophycean manuals now in vogue as possessing lateral attachment of the filaments; although there is nothing in Gomont's description or in Wittrock & Nordstedt, *Algae Exsiccatae* 1522a–c, determined by M. Gomont, to lead us to believe that the attachment is not basal.

[1] My conception of this species has been based solely upon the descriptions and figures in Gomont's 'Monographie' and in Möbius, Hedwigia **28**: 312 (1889), and upon such presumably unauthenticated specimens as Phyc. Bor.-Amer. 53 and 1008. In a recent comparative study of the herbarium material which I have included in this species, I find one specimen, PARÁ: on Utricularia in fish ponds, Museu Paraense, Belém, *Drouet 1275*, 27 June 1935 (D, F, N, S, Y, Herb. Univ. Mich., Rijksherb. at Leiden, Mus. Nac. at Rio de Janeiro) distributed as *L. Lagerheimii* and noted as such in my article, The Brazilian Myxophyceae, I, Amer. Journ. Bot. **24**: 604 (1937), to be referable to *L. Digueti* Gom. (see footnote 9 of this paper).

(1935). *L. ferruginea* of Farlow, Rept. U. S. Fish Comm. 1875: 24 (1876). Authentic material: Rabenh. Alg. 773 (F), 2055 (F, T).—*F. limicola* Gom., f. *natans* Gom., f. *symplocoidea* Gom., f. *ferruginea* (Ag.) Gom., and f. *aeruginosa* (Ag.) Wolle ex Gom., ibid. 129, 130 (1892), appear in the southern Massachusetts region to be rather ecological variations of a single variable species than distinguishable taxonomic entities. The species is the commonest of the Lyngbyas in brackish and salt water; it is the chief constituent of the extensive subaerial growths of Myxophyceae on mud of salt marshes. In none of our specimens is the sheath colored blue when treated with chlor-zinc-iodine as described for *L. stagnina* Kütz. ex Gom. (pro synon. *L. aestuarii*) by Lemmermann, Forschungsber. biol. Sta. Plön **12**: 145 (1905), and by Boye-Petersen, Bot. Icel. **2**(2): 285, f. 6 (1928). Specimens examined: EASTHAM: salt marsh, Bay shore, *F. S. Collins*, 10 Aug. 1907 (Phyc. Bor.-Amer. 1402, W, T, not Y). FALMOUTH: subaerial, Penzance salt marsh, Woods Hole, *Drouet 1892*, 19 July 1936 (D), *Drouet 1178*, 13 July 1934 (D, Y); Gansett Pond No. 2, *W. R. Taylor*, 6 July 1917 (T); Falmouth, *F. S. Collins*, July 1880 (F); Penzance Point, *R. A. Esten*, 5 July 1893 (W); Park Ditch, Woods Hole, *E. T. Rose*, 22 July 1936 (D); Siders Pond, *H. Croasdale*, 6 Aug. 1930 (D); Wood's Holl, *Herb. C. L. Anderson* (N). MATTAPOISETT: on Spartina, *F. S. Collins*, 14 Sept. 1902 (N; Phyc. Bor.-Amer. 1009, W, T, Y). GOSNOLD: Nonamesset Island, *E. T. Rose*, 29 June 1936 (D, F, T); Deer Pond, Nonamesset Island, *H. Croasdale*, 2 July 1934 (D, N, S); Botanical Survey of Penikese Island, 24 July 1923 (W); brackish pools, Naushon Island, *Anon.*, July 1908 (W); Shore Pond, Tarpaulin Cove, *W. R. Taylor*, 4 Aug. 1927 (T). EDGARTOWN: mats over decaying Zostera leaves in a salt marsh, *M. A. Howe*, 8–18 Aug. 1900 (N).

LYNGBYA MAJUSCULA (Dillw.) Harv. ex Gom., Ann. Sci. nat. VII Bot. **16**: 131, pl. iii, f. 3, 4 (1892); Farlow, Rept. U. S. Comm. Fish & Fisheries 1871–72: 293 (1873), Proc. Amer. Acad. **10**: 380 (1875), Rept. U. S. Fish Comm. 1875: 24 (1876); Collins, Alg. Am. Bor. Exs. **5**: 228 (1889); Farlow, Mar. Alg. New Engl., 34 (1891); Setchell, Phyc. Bor.-Amer. **5**: 202 (1896); Collins, RHODORA **2**: 42 (1900); Tilden, Minn. Alg. **1**: 123 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); Croasdale, Fresh Water Alg. Woods Hole, Mass., 21 (1935). Authentic material: Rabenh. Alg. 588 (T); Harv., Friendly Ids. Alg. 120 (F), 121 (F); Harv., Ceylon Alg. 84 (F).—This species, usually found only in marine waters, is often confused, as Geitler has pointed out in Rabenh. Kryptogamen-Fl. **14**: 1060 (1932), with the strictly freshwater *Plectonema Wollei* Farl. ex Gom. In the Woods Hole region, *L. majuscula* is usually washed ashore in large clumps; less often it is seen as extended strata on mud in quiet salt water. Specimens seen: BOURNE: Scraggy Neck, *A. M. Russell*, 13 Aug. 1917 (T); Pocasset, *M. Sumwalt*, 25 July 1925 (T). FALMOUTH: Nobska, *W. G. Farlow* (F); Bay traps, Woods Hole, *Anon.*, 30 Aug. 1932 (D); Little

Harbor, Woods Hole, *Anon.*, 20 June 1931 (W); Wood's Hole, *B. L[ivingston]*, Aug. 1875 (D, F, T, Y); Woods Holl, *R. A. Esten*, July 1893 (W); washed ashore, Wood's Hole, *W. A. Setchell*, 16 Aug. 1894 (Phyc. Bor.-Amer. 202, N, T, W, Y); Woods Holl, *Herb. A. B. Hervey 9* (N); Falmouth, *G. W. Perry*, 22 Aug. 1882 (N); Falmouth, *F. S. Collins*, July 1880 (F); Falmouth, *Anon.*, July 1882 (T); floating, Woods Holl, *W. A. Setchell*, 18 July 1890 (F, N); Wood's Hole, *D. C. Eaton*, Aug. 1871 (Y); Woods Hole, *I. Holden*, 17 Aug. 1894 (F, N); Vineyard Sound, *W. G. Farlow* (F); Juniper Point, Woods Hole, *W. R. Taylor*, 9 Aug. 1928 (T); Meganset Beach, North Falmouth, *W. R. Taylor*, 21 July 1931 (T, D). TISBURY: Vineyard Haven, *F. S. Collins* (W), Sept. 1883 (Alg. Am. Bor. Exs. 228, D, F, Y). OAK BLUFFS: Highlands, *C. C. Curtis*, 11 July 1892 (N). EDGARTOWN: floating in its harbor, *M. A. Howe*, 8 Aug. 1900 (N). MATTAPOISETT: *G. W. Perry*, 19 Aug. 1884 (N).

LYNGBYA CONFERVOIDES Ag. ex Gom., Ann. Sci. nat. VII Bot. **16:** 136, pl. iii, f. 5, 6 (1892); Collins, RHODORA **2:** 42 (1900); Tilden, Minn. Alg. **1:** 119 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913). *L. lutco-fusca* of Farlow, Rept. U. S. Fish Comm. 1875: 24 (1876), Alg. Am. Bor. Exs. **1:** 48, Mar. Alg. New Engl., 35 (1891). *L. semiplena* of Setchell, Phyc. Bor.-Amer. **30:** 1452b (1908), not of Nott, ibid. 1452a; Tilden, Minn. Alg. **1:** 118 (1910), in part; Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935), in part; not J. Ag. ex Gom. Authentic material: Farl., Anders. & Eat., Alg. Am. Bor. Exs. 48 (F, N, Y); Hohenack. Meeresalg. 500(T).—Found on intertidal zones of wharf pilings, rocks, and shores, also in tide pools. New England material rarely exceeds 12 μ in trichomatal diameter. I have been unable to locate the specimens from brackish water of Chara Pond reported by Croasdale, ibid. 21 (1935). Specimens seen: FALMOUTH: with *L. majuscula*, Meganset Beach, North Falmouth, *W. R. Taylor*, 21 July 1931 (T, D); Little Harbor, Woods Hole, *G. J. Hollenberg*, 27 July 1934 (D), *W. A. Setchell*, 18 Aug. 1894 (Phyc. Bor.-Amer. 1452b, W, T, Y), *H. Croasdale*, 30 July 1934 (D, F, T); on government wharf, Woods Holl, *W. G. Farlow*, Aug. 1876 (F); ad lapides et saepes, Wood's Holl, *W. G. Farlow* (Alg. Am. Bor. Exs. 48, F, N, Y). NO MAN'S LAND: *W. R. Taylor 17035*, 16 Aug. 1932 (T, D).

LYNGBYA SEMIPLENA (Ag.) J. Ag. ex Gom., Ann. Sci. nat. VII Bot. **16:** 138, pl. iii, f. 7–11 (1892). Not *L. semiplena* of Nott, Phyc. Bor.-Amer. **30:** 1452a (1908), nor of Setchell, idem 1452b (1908); not of Tilden, Minn. Alg. **1:** 118 (1910), at least as to southern Massachusetts specimens; not of Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913); not of Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935). Authentic material: Wittr. & Nordst., Alg. exs. 280 (F); Hauck & Richt., Phyk. univ. 328 (F).—Found in the same type of habitat as *L. confervoides* and often mixed with it; often collected in brackish water. Phyc. Bor. Amer. 1452a is treated in the present paper as *Phormidium ambiguum*, 1452b as *L. confervoides;* Davis' uncertain

material is referred to under *Symploca atlantica*. Specimens seen: FALMOUTH: on wooden piers, Little Harbor, Woods Hole, *Drouet 1923*, 20 Aug. 1936 (D, F, S, T, Y); on wood submerged in Mill Pond, Woods Hole, *Drouet 1929*, 25 Aug. 1936 (D, F); on Zostera in Eel Pond, *Drouet 1014*, 15 July 1930 (D).

LYNGBYA LUTEA (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **16**: 141, pl. iii, f. 12, 13 (1892); Collins, Phyc. Bor.-Amer. **32**: 1611 (1910), in minor part. *L. tenerrima* Born. ex Gom. *pro synon.*, loc. cit. (1892); Thur. ms. in Farlow, Mar. Alg. New Engl., 35 (1891), sec. specim. authent. in Herb. Farlow.—Our material is very similar to that distributed from Herb. Thuret in the Farlow Herbarium: FRANCE: Biarritz, *No. 55*, 10 juin 1870. This species is found in situations similar to those in which *L. confervoides* and *L. semiplena* are found; it is easily distinguished from the two latter species by the smaller trichomatal size and the reaction of the sheath to chlor-zinc-iodine. The filaments referred to as *L. lutea* in Phyc. Bor.-Amer. 1611 are few and very doubtful. Specimens seen: EASTHAM: 'Sunken Meadow,' *F. S. Collins*, 13 Sept. 1909 (Phyc. Bor.-Amer. 1611, in minor part, *specim. manca*, W, T, Y). FALMOUTH: on rocks at outlet of Oyster and Chara Ponds into Vineyard Sound, *Drouet 2172*, 29 Aug. 1937 (D, F, N, S); in drain of Supply Department Building, Woods Hole, *Drouet 1913*, 13 Aug. 1936 (D, F, S, T, Y); on pilings, Penzance Garage, Woods Hole, *G. J. Hollenberg*, 27 July 1934 (D).

LYNGBYA OCHRACEA (Kütz.) Thur. ex Gom., Ann. Sci. nat. VII Bot. **16**: 149 (1892). Authentic material: Rabenh. Alg. 58 (F), 2333 (F).—Observed in varying abundance in freshwater pools, etc. See Geitler, Rabenh. Kryptogamen-Fl. **14**: 1050 (1932). Specimens seen: FALMOUTH: in pool across road from entrance to Cedar Swamp, Woods Hole, *Drouet 1957*, 15 Sept. 1936 (D, F, S, T, Y). GOSNOLD: in spring water flowing into Cuttyhunk Pond, Cuttyhunk Island, *Drouet 2120*, 3 Aug. 1937 (D, F, N, S).

SYMPLOCA Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 104 (1892). —The fascicles of filaments produced on the surface of the plant mass in this genus are not always macroscopically visible. Perhaps in the majority of collections the fascicles are microscopic bundles of filaments either standing upright or closely appressed to the surface of the stratum. If the plant-mass has developed entirely beneath the surface of the water, it is improbable that fascicles will be formed at all; they are recognized only after the mass has developed, at least for a certain period of time, under subaerial conditions.

KEY TO SPECIES

I. Plants of salt or brackish habitats
   A. Plant-mass blackish-green, fasciculate-caespitose; fascicles erect, to 1 cm. high; filaments apparently unbranched, very closely intricated, often angulose-tortuose; sheaths thin, firm, coloring blue when treated with chlor-zinc-iodine; trichomes yellowish-green or

blue-green, 4–6 μ in diameter, always constricted at the cross-walls; cells usually quadrate or shorter than wide; protoplasm scarcely granulose; cross-walls pellucid, never granulated; outer membrane of the apical cell thickened into a depressed-conical calyptra.....*S. atlantica*

B. Plant-mass dirty green, rarely bluish-black, fasciculate-caespitose; fascicles to 3 cm. high, erect, spiniform, often discolored below because of empty sheaths; filaments compactly interwoven, somewhat agglutinated, here and there falsely branched, variously angulose-tortuose; sheaths thin, somewhat mucous, not readily coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, 6–14 μ in diameter, often torulose at the apices; cells somewhat longer than the diameter or (in broader trichomes) half as long as wide, 5–14 μ long; protoplasm granulose, cross-walls often granulated; apical cell slightly inflated, without calyptra....*S. hydnoides*

1. Trichomes 6–8 μ in diameter, cells as long as or longer than wide.....var. *genuina*
2. Trichomes 8–14 μ in diameter, cells subquadrate to half as long as wide.....var. *fasciculata*

II. Plants of fresh, not of salt or brackish, habitats

A. Plant-mass blackish-blue-green, expanded; fascicles spiniform, to 2 mm. high; filaments unbranched, at the base contorted and irregularly interwoven, in the fascicles more or less parallel and agglutinated; sheaths firm, thin, somewhat mucous, coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, never constricted at the cross-walls, slightly attenuated at the apices, 3.4–4 μ in diameter; cells subquadrate or somewhat longer or shorter than wide, 1.5–5.5 μ long; cross-walls conspicuous, never granulated; apical cell obtuse-conical, without calyptra.....*S. muralis*

B. Plant-mass blue-green, grayish, brown, or blackish, phormidioid or fasciculate, sometimes giving a cottony appearance on damp ground; fascicles tortuous, repent, rarely erect; filaments seldom branched, tortuous, much entangled in the basal stratum, in the fascicles less tortuous and often subparallel; sheaths firm or sometimes mucous, coloring blue when treated with chlor-zinc-iodine, up to 2 μ in thickness; trichomes blue-green or olive-green, never constricted at the cross-walls, 5–8 μ in diameter; cells subquadrate to twice as long as wide, 5–11 μ long; protoplasm coarsely granulose; cross-walls not conspicuous, never granulated; apical cell rounded or obtusely conical, the outer membrane slightly thickened.....*S. Muscorum*

Symploca atlantica Gom., Ann. Sci. nat. VII Bot. **16:** 109, pl. ii, f. 5 (1892). *Lyngbya semiplena* of Davis, Bull. U. S. Bur. Fish. 1911 (2): 798 (1913), not J. Ag. ex Gom. *S. Muscorum* of Croasdale, Fresh Water Alg. Woods Hole, Mass., 19 (1935), not Gom.—This is an inhabitant of wood and rock walls sometimes washed by waves. Our material has the short articulations and the depressed-conical calyptras of the European plant and is not to be confused with *S. funicularis* Setch. & Gardn., Univ. Calif. Publ. Bot. **6:** 469 (1918), as

distributed under the name *S. atlantica* in Phyc. Bor.-Amer. 1356. Material from my collection *1922* cited below has been compared with authentic specimens by Prof. Frémy. *S. atlantica* may sometimes be confused with *Phormidium submembranaceum*, which often is collected also on rocks and woodwork washed by waves. Specimens seen: FALMOUTH: subaerial on floating wooden piers beside U. S. Lighthouse Service Building, Woods Hole, *Drouet 1922*, 20 Aug. 1936 (D, F, S, T, Y, Frémy); Eel Pond, Woods Hole, *F. S. Collins*, 16 Aug. 1904 (sub. nom. *Lyngbya semiplena*, etc., F); subaerial at high tide mark on concrete walls of Supply Department Building, Woods Hole, *Drouet 1914*, 13 Aug. 1936 (D); subaerial, Gardiner's Ditch, Woods Hole, *Drouet 1015*, 20 July 1930 (*specim. mancum*, D).

SYMPLOCA HYDNOIDES Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 106, pl. ii, f. 1–4 (1892); Collins, RHODORA **2**: 42 (1900). *Phormidium pulvinatum* Collins[1] in Britton & Millspaugh, Bahaman Fl., 621 (1920), not Woronich. Authentic material: Desmaz., Pl. cryptog. France, éd. I, 1972 (F).—The var. GENUINA Gom. is seen mixed with other Myxophyceae in intertidal zones and salt marshes, the var. FASCICULATA (Kütz.) Gom. on larger algae in quiet salt water. Specimens seen: FALMOUTH: Menauhant, *F. S. Collins*, July 1882 (N). GOSNOLD: on mud among Spartina roots, Naushon Island, *W. A. Setchell*, 16 July 1891 (sub. nom. *S. fasciculata*, N); Hadley Harbor, Naushon Island, *W. R. Taylor*, 11 July 1931 (T, D), *Anon.*, 12 July 1931 (Herb. G. W. Prescott), *C. M. Palmer*, 28 Aug. 1937 (D, N, S).

SYMPLOCA MURALIS Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 112, pl. ii, f. 10 (1892); Setchell, Bull. Torr. Bot. Club **22**: 429 (1895); Croasdale, Fresh Water Alg. Woods Hole, Mass., 19 (1935). Authentic material: Rabenh. Alg. 142 (F), 293 (F).—Apparently not uncommon in the region on moist soil and among mosses. In rapidly growing plant masses, the cells are often somewhat longer than wide. Where the fascicles are not well developed, masses may be difficult to distinguish from those of *Phormidium Corium* and *P. papyraceum*. Specimens seen: FALMOUTH: on the ground around the railroad well, Wood's Holl, *W. G. Farlow*, Aug. 1876 (F, P); on ground near a pump, East Falmouth, *W. A. Setchell 340*, 12 July 1891 (D, duplicate of specimen in Herb. Univ. Calif., obligingly sent to me by Prof. Setchell); sandy path, Woods Hole, *Collins 5150*, 16 Aug. 1904 (sub. nom. *S. Muscorum*, N); earth, Quisset Road, *W. R. Taylor*, 9 July 1922 (T). FAIRHAVEN: on wet soil among rocks, Sconticut Point, *Drouet 2174*, 1 Sept. 1937 (D, F, S, N, T).

SYMPLOCA MUSCORUM (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **16**: 110, pl. ii, f. 9 (1892); not of Croasdale, Fresh Water Alg. Woods

[1] The TYPE material of *P. pulvinatum* Collins, BAHAMA ISLANDS: Cockburn Harbor, South Caicos, *M. A. Howe 5593*, 16 Dec. 1907, in Herb. New York Bot. Gard., differs in no respect from the authentic material of *S. hydnoides* cited here. *P. pulvinatum* Woronich. is now more properly designated *P. Woronichinii* J. DeToni, *Noterelle di nomencl. algol. I. Alcuni casi di omonimia* (*Missoficee*), 7 (1934).

Hole, Mass., 19 (1935). *Phormidium Retzii* of Croasdale, ibid. 20 (1935), not Gom. Authentic material: Rabenh. Alg. 244 (F), 929 (T). —Frequently seen on moist soil in depressions and in greenhouses, sometimes among other submersed algae in ponds. Plant-masses having the described characters of f. *genuina* Gom. apud Frémy and f. *inundata* Gom. apud Frémy, Mém. Soc. nat. Sci. nat. & math. Cherbourg **41**: 83 (1934), are collected in the Woods Hole region; but material of both forms appears to develop fascicles in exactly the same manner when transferred to the laboratory and grown under subaerial conditions. Specimens seen: MASHPEE: in John Pond, *C. M. Palmer*, Sept. 1937 (D). FALMOUTH: on soil in greenhouse near railroad station, Falmouth, *Drouet 1933*, 29 Aug. 1936 (D, F); on soil in a pasture, Sippewisset, *Drouet 1935*, 4 Sept. 1936 (D, F, S, T, Y); on soil in a depression east of Iron Pond, Woods Hole, *Drouet 1938*, 12 Sept. 1936 (D, T); in spring north of Nobska Point, *C. M. Palmer*, Sept. 1937 (D). GOSNOLD: freshwater pond, Pasque Island, *H. Croasdale*, 26 June 1934 (D); Pink Pond, Nonamesset Island, *H. Croasdale*, 2 July 1934 (D).

(*To be continued*)

WESTERN EXTENSION OF THE RANGE OF PINUS BANKSIANA IN NEW YORK

W. F. Pratt and E. W. Littlefield

For the past thirty years or more the known distribution of *Pinus Banksiana* in New York has been confined to certain portions of the Lake Champlain watershed in Clinton and Essex counties. No stations have been reported, during this time, which would materially extend the range as outlined by the early observations of Sears[1] and Peck.[2] House[3] lists *Pinus Banksiana* as "rare" in northern New York, citing the stations reported by Peck in the Ausable and Bouquet valleys. The junior writer[4] described the association of this species with *Pinus rigida* Mill. at Clintonville, Essex County, and has noted its occurrence in a number of other unreported localities, all however, within the general limits of the range as indicated above.

In the summer of 1931, the senior writer discovered a group of *Pinus Banksiana* growing on a sandy knoll along the east bank of the Deer River in the Town of Brasher in eastern St. Lawrence County,

[1] Bull. Essex Inst. 13 (1881) pp. 174–178.
[2] N. Y. State Museum Vol. V. No. 25 (1898).
[3] N. Y. State Museum No. 254 (1924).
[4] Littlefield: Rhodora xxx (1928) pp. 129–131

within a mile of the Brasher Iron Works. Although this was reported to the junior writer at the time, the latter did not have an opportunity to visit the locality until the past October, when more detailed observations were made by both writers.

The trees in question comprise a stand of about 30 individuals, of which the largest is now thirty feet high, 7.2 inches in diameter at breast height and approximately 25 years old. The majority of the trees appear to be of about the same age and evidently became established here following a burn. A number of scattered trees are to be found east of the main group to a distance of 600 feet. Other species in mixture with the jack pines are *Populus tremuloides* Michx., *P. grandidentata* Michx., and *Betula populifolia* Marsh.

The soil here is the excessively acid Saugatuck fine sand, a feature not surprising in view of the well-known preferences of *Pinus Banksiana* in this respect.[1] Located seven miles from the St. Lawrence River at an elevation of 240 feet above sea level, this formation is typical of the deposits found in northwestern New York within the former limits of the glacial Lake Iroquois.

The isolated position of this station with respect to the previously reported occurrence of *Pinus Banksiana* in New York will be noted by the fact that it lies approximately 50 miles to the west and northwest, respectively, from the nearest stations in Clinton and Essex counties, viz., Altona and Wilmington. No occurrence of the species has been reported in Franklin County, or further westward in the state.

The station appears to be equally isolated as regards the adjacent portions of Canada since *Pinus Banksiana* is virtually absent from southern Quebec,[2] (the outlier at Rigaud is probably the only station within 50 miles of the international boundary in this region), and does not approach the St. Lawrence River in Ontario[3, 4].

CONSERVATION DEPARTMENT,
Albany, N. Y.

[1] Fernald: RHODORA xxi (1919) pp. 41–67.

[2] Marie-Victorin: Les Gymnospermes de Québec. Contr. du Lab. de Bot. de Univ. de Montréal No. 10 (1927).

[3] Drummond: Canad. Nat. n. s. III (1866–68) pp. 161–167.

[4] Zavitz: Forests and Forestry in Ontario in Special Rept. to Brit. Emp. For. Conf., Ottawa (1923) p. 7.

A NEW TRIODIA FROM OKLAHOMA

H. I. Featherly

On October 22, 1937, Mr. A. E. Wade of the Soil Conservation Service brought in to the author a number of grass samples. One of these was recognized as a new grass for Oklahoma and further study proved it to be an undescribed species. The specimens of this new grass were taken from a patch found growing about 5 miles west and 3 miles north of Stillwater, Oklahoma, in a moist silt loam meadow. Mr. Ray Penn, who is engaged in range survey work in the state and who examined the specimens, has since found it growing near Collinsville, Oklahoma. There is no known distribution of the plant outside the state.

Triodia **oklahomensis** sp. nov. Culmi erecti, cristati, 12–15 dm. alti; rami floriferi vel inclusi vel exserti ex nodis mediis orientes; panicula terminali angusta 20–35 cm. longa; vaginae laxae carinatae; laminae glabrae, usque ad 12 mm. latae, usque ad 6 dm. longae a vaginis superioribus post maturitatem deciduae; panicula vel paulum exserta vel inferne inclusa, angusta, purpurea, aliquantulum viscida, ramis longis, appressis; spiculae breviter pedicellatae, 6–8 mm. longae, 4 mm. latae, constantes 7–9-flores; glumae circiter 4 mm. longae, paene aequales.

Stems erect, tufted, 12 to 15 dm. tall, with either included or exserted panicle-bearing branches from the middle nodes, and a narrow terminal panicle 20 to 35 cm. long; sheaths loose, keeled; blades smooth, variable in width up to 12 mm. and in length up to 6 dm., falling freely from upper sheaths after maturity; panicle short exserted or included at the base, narrow, purplish, more or less viscid, branches long, appressed-ascending; spikelets short pediceled, 6 to 8 mm. long, 4 mm. wide, 7 to 9 flowered; glumes about 4 mm. long, nearly equal.

The type is in the U. S. National Herbarium, collected in a moist silt loam meadow, about 5 miles west and 3 miles north of Stillwater, Oklahoma, October 22, 1937, by A. E. Wade. Co-types are deposited in Missouri Botanical Garden, St. Louis, Mo., and in Oklahoma A. and M. College Herbarium, Stillwater, Oklahoma.

This species is distinct enough to be recognized from other species of the genus at quite a distance in the field. Its closest relative is perhaps *T. flava* (L.) Smyth. which it resembles in having a purple, more or less viscid panicle. It is similar in size and is found in the same kind of habitat. It differs in having panicle-bearing branches

from the middle nodes, a slender panicle with long appressed branches and short pediceled open spikelets.

In Hitchcock's Manual of the Grasses of the United States this species keys out to *T. flava*, but the differences mentioned above enables one to separate them easily.

The writer wishes to express here his appreciation to Mrs. Agnes Chase, of the National Herbarium, for generous assistance in checking this plant with National Herbarium specimens.

OKLAHOMA AGRICULTURAL AND MECHANICAL COLLEGE,
Stillwater, Oklahoma.

REGULATIONS CONCERNING THE GASPESIAN NATIONAL PARK.—The following regulations have been adopted by Order in Council, respecting the Gaspesian National Park:

Pursuant to article 9 of chapter 47 of the Statute 1, George VI, concerning the Gaspesian National Park,

That it be prohibited:

a) To hunt, in any manner whatsoever, the animals which are within the limits of the said park;

b) To have in one's possession, within the limits of the park, hunting implements of any nature whatsoever;

c) To enter the limits of the park without a special permit from the superintendent or the person named for such purposes;

d) To gather wild plants for any purposes whatsoever, without a written authorization from the Superintendent of the Park.—L. A. RICHARD, Deputy Minister of Mines and Fisheries, Province of Quebec.

For permits and further information botanists planning to visit the Shickshock Mountains should apply to SUPERINTENDENT OF THE GASPESIAN NATIONAL PARK, Department of Mines and Fisheries, Quebec.

FURTHER NOTE ON VERBENA STRICTA FORMA ALBIFLORA

HARRY V. TRUMAN

In the summer of 1934 the writer observed a very few plants of *Verbena stricta* Vent. forma *albiflora* Wadmond[1] scattered in a patch of the typical purple-flowered form of *V. stricta* in a pasture about two miles east of Rockton, Illinois, and several miles to the west of the

[1] RHODORA, XXXIV. 19 (1932).

station reported by Wadmond[1] in 1932. Continued observation of the colony during the summers of 1935 and 1936 revealed the fact that the white-flowered form was increasing in numbers and spreading to the adjacent roadside. In 1937 it was noted that not only had this form increased in its importance in the original station, but also that several specimens had appeared in a farmyard a half mile distant. Members of the family living upon the farm where the white-flowered form was first noted remember that in 1933 the station consisted entirely of purple-flowered plants. This observation is not reliable, however, for in 1934 the relative number of white-flowered plants was so small as to be evident only to a practised observer.

This form differs from the typical *V. stricta* not only in that its flowers are pure white, but also that its stems completely lack the purple color that is invariably characteristic of the purple-flowered form. These differences seem to indicate that some change has taken place in the genetic make-up of the plant to inhibit the development of the pigment, presumably anthocyanin, which gives the typical form its color. In all other respects the white-flowered form resembles the typical, although in a dozen specimens tagged at random early in the season and collected near the end of the flowering period for the purpose of obtaining seeds, the white-flowered plants were all notably taller, sturdier plants than the purple-flowered. This difference may have been purely accidental. At no time in the four years during which this station has come under the observation of the writer has there appeared any intermediate form. All individuals have been either typical *V. stricta*, or pure white. It is interesting to note here that this lack of intermediates has been observed by Benke[3] where *V. stricta* Vent. forma *rosciflora* Benke grows with typical *V. stricta*. A rather careful reconnaissance of the locale of the Wadmond collections failed to reveal any plants of the white-flowered form remaining in 1937.—Northern Montana College, Havre, Montana.

NORTHEASTWARD EXTENSIONS IN THE MAINE FLORA—II

George B. Rossbach

Potentilla canadensis L. is represented only locally northward and eastward into the state of Maine. Potentilla simplex Michx.,

[1] S. C. Wadmond, personal communication.
[2] Rhodora, xxxiv. 10 (1932).

and more especially its variety CALVESCENS Fernald, are well known in the state, and the latter very common through Maine and into Canada.

It is of some note, however, that P. CANADENSIS L. should be found as far northeast as Rockport, Knox County, Maine. A collection was taken from open land, in grass-turf, southwest side of Lilly Pond, May 19, 1937, *G. B. Rossbach*. Other stations in Maine, recorded from collections of the New England Botanical Club and Gray Herbarium, are as follows: sandy railroad embankment, Topsham, Sagadahoc Co., May 6, 1898, *E. B. Chamberlain*, no. 556; old cemetery, Bath, Sagadahoc Co., June 3, 1913, *Kate Furbish;* Brunswick, Cumberland Co., July 25, 1901, May 25, 1912, *Kate Furbish;* Cape Porpoise, York Co., May 25, 1895, *M. L. Fernald;* North Berwick, May 1892, and 1893, *J. C. Parlin;* South Berwick, June 13 and 14, 1896, *J. C. Parlin & M. L. Fernald*. The species has been fairly well collected from southern New Hampshire. There is one isolated collection from dry gravelly barrens and fields, Shelburne, Shelburne Co., Nova Scotia, *M. L. Fernald*, no. 2553.

The more isolated northeastern localities from which P. CANADENSIS has been collected are, so far as ascertained, areas made suitably clear, or even barren, for the growth of the plant by continued human activity. It is possible that northeast of York Co., Maine *P. canadensis* may be introduced.

The station at Lilly Pond, Rockport, is an old field, in an area cleared and partially quarried, as well as farmed, in the early history of Rockport.

PANAX TRIFOLIUM L., well represented northeastward into southern New Hampshire, becomes more and more local on into Maine.

In Gray Herbarium is one collection from as far northeast as Prince Edward Island: rich deciduous woods, Harmony, Kings Co., July 7, 1914, *M. L. Fernald & Harold St. John*, no. 11138.

But neither the Gray nor the New England Botanical Club Herbaria at Harvard contain any specimens from Maine northeast of East Mercer, Somerset Co., where the plant was collected by *Abbie E. Packard* (no date or number). East Mercer is in the valley of the Kennebec, about five miles from that river, and the other localities in the state are in the same drainage or some others to the southwest.

On May 17, 1937 the writer came upon a small patch of PANAX TRIFOLIUM in a rich hollow in heavy mixed woods near Pitcher Pond, Northport, Waldo Co.

Mr. *Thomas Ripley*, a local botanist of Lincolnville, Maine, has shown me specimens of *Panax trifolium* which he collected several years ago in a rich woodland near Lake Megunticook, Lincolnville, Waldo Co.

BIDENS COMOSA (Gray) Wiegand appears, in herbaria, to be very local in Maine. It has been collected from a damp field, Orono, Penobscot Co., Sept. 19, 1889, by *M. L. Fernald*, and the specimen is in the herbarium of the New England Botanical Club. In recent years it was collected by the writer from boggy woods near Ducktrap River, Lincolnville, Waldo Co. This seeming rarity of BIDENS COMOSA in this region may, of course, be due to poor representation of the species in herbaria.

Collections made by the writer and referred to in this article are to be found in the herbarium of the New England Botanical Club.

DUDLEY HERBARIUM,
Stanford University.

WHERRY'S GUIDE TO THE FERNS OF THE CENTRAL ATLANTIC STATES.[1]—Dr. Wherry has probably a wider field knowledge of the ferns of eastern North America than anyone else now living. It is therefore good news that some of this knowledge has been made conveniently available to the public, even in the severely limited space of a pocket manual, covering only the states from New Jersey and Pennsylvania to Virginia.

Brevity has plainly been a controlling consideration in the preparation of the book. Descriptions are rigidly confined to a single page; the index has likewise been cut to one, rather confusingly arranged, page; and only the rudiments of a key have been admitted. But the author has contrived to include an ample, original and, for the layman, most helpful glossary of technical terms; essential synonymy, given intelligibility for the beginner by being thrown into narrative form; descriptions giving characters which, though not always technically the most important, are diagnostic and contrasting; and detailed and accurate statements of ranges and habitats such as have not appeared in previous popular works. In addition, supplementary chapters give good advice as to the cultivation of ferns and the sort of soils and other conditions needed by a considerable list of species.

Except in *Isoetes*, where they all look alike, each species is illustrated by a habit-sketch and drawings of details, placed on the page opposite the description. In the absence of a key, these illustrations are the primary means of making determinations. Not all of them are equal to this function: though many show an excellent faculty for catching the characteristic posture of the plants concerned and are otherwise clearly and skillfully done, some are stiff and conventionalized to the point of misrepresentation. I doubt if the average user, standing before a lush clump of Christmas fern in the woods, would suspect it to be the same as the attenuated design which does duty for it in the book. High magnification would be needed to reveal in the minute glandularity of *Woodsia obtusa* and *W. scopulina* anything resembling the

[1] Wherry, Edgar T. Guide to Eastern Ferns. Science Press Printing Co., Lancaster, Pennsylvania. [Dec.] 1937, 220 pp., 96 ill. $1.00

relatively huge spike-like processes figured for those species. In the latter, moreover, the glandularity of stipe and rachis is also badly exaggerated and the characteristic long hairs are altogether missing in the enlarged pinnule. The pinnule drawn under *Dryopteris cristata* belongs to some other species, probably *D. spinulosa;* and whatever the sheath ascribed to *Equisetum variegatum* may be, it is not of that species.

Because the illustrations take the place of a key, these imperfections in detail are more important than they would otherwise be. Even so, they should not obscure the fact that this little book shares with Dr. Small's "Ferns of the Vicinity of New York" the advantage of having been written by a competent professional; it carries a correspondingly greater authority and reliability than most popular fern books, and it should lead the beginner and the layman in an essentially right direction.—C. A. WEATHERBY.

EXTENSION OF THE RANGE OF RANUNCULUS PURSHII.—On July 21, 1937 *Ranunculus Purshii* Richardson was found growing on a muddy hummock in Gott Brook, Springfield, Penobscot County, Maine. Some of the plants extended into the water while others were growing, at that time, above the water-level. This station is situated a few hundred yards north of where Gott Brook crosses the main road leading from Lee to Springfield.

Previous to this time the most southerly station for Maine, and also the most southeasterly station for North America was in New Limerick, Aroostook County.[1]

Mr. E. C. Ogden of the Gray Herbarium has very kindly verified the determination as made by the writer. A specimen from this station has been deposited in the Herbarium of the New England Botanical Club.—MAYNARD W. QUIMBY, University of Maine, Orono, Maine.

[1] Fernald and Wiegand, RHODORA, xii. 139 (1910).

Volume 40, no. 473, including pages 185–220 and plates 492–494, was issued 7 May, 1938.

AUG 1 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. July, 1938. No. 475.

CONTENTS:

Plants New to Missouri. *Julian A. Steyermark* 249

Oscillatoriaceae of Southern Massachusetts (concluded). *Francis Drouet* 255

Notes on the Flora of Nova Scotia. *A. E. Roland* 273

Notes from the University of Minnestoa Herbarium—I. *John B. Moyle* 275

Tuckerman to Carey (letter) 277

Chromosomes of Kalmiopsis. *J. T. Baldwin, Jr.* 278

Plants New to Minnesota. *Olga Lakela* 279

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **July, 1938.** **No. 475.**

PLANTS NEW TO MISSOURI

JULIAN A. STEYERMARK

SINCE the publication in 1935 of "An Annotated Catalogue of the Flowering Plants of Missouri" by Palmer and Steyermark,[1] the junior author has made extended expeditions into remote and previously uncollected areas of the state. The main purpose of these explorations has been to gather additional records for completing ranges of species in the state in connection with the preparation by the two authors of a manual of the flora of Missouri and adjacent Ozark region. These trips have yielded valuable additions to the state flora, and in many cases have extended considerably the ranges of a number of species in the last edition of Gray's Manual.

Of the 38 new records given below, 24 are species entirely new to Missouri, of which 6 are species of *Carex* and 2 are species of *Eleocharis;* 7 are varieties, 3 are forms, 1 was previously reported but the report has never been authenticated by a specimen, and 3 are hybrids new to the state.

All collections made by the author as given in the citations below may be found in the Herbarium of the Missouri Botanical Garden. Most of the determinations of grasses were made or verified by Mrs. Agnes Chase, of *Carex* by Dr. F. J. Hermann, of *Eleocharis* by Dr. H. K. Svenson, of *Sisyrinchium* by Mr. E. J. Alexander, and of *Liparis* by Professor Oakes Ames.

CHEILANTHES TOMENTOSA Link. This fern was suspected of occurring in the state several times, but each time the matter was checked, it was found that the specimen had been misdetermined, and the

[1] Palmer, E. J. and J. A. Steyermark, in Ann. Mo. Bot. Gard. **22**: 375–758. 1935.

conclusion had just about been drawn that the fern was not to be found in the state. During the summer of 1935 while collecting in the White River territory of southwestern Missouri in Stone Co., the author was exploring some steep limestone bluffs when suddenly he encountered several plants of this local fern. Careful study of the specimens revealed their identity, and the species can now be assigned to the state flora.

One-half way up exposed crevices of limestone bluffs on escarpment at mouth of Indian creek and White river, near Baxter, Stone Co., Aug. 22, 1935, *Steyermark 19530.*

Bromus purgans L., f. laevivaginatus Wiegand. Lower portion of wooded slopes along North Fork of White river, near Rainbow (Double) Spring, 4 mi. southeast of Dora, Ozark Co., May 16, 1936, *Steyermark 10456.*

Festuca rubra L. A few plants establishing themselves in low woods near cabin along Big Piney river near Hooker, Pulaski Co., May 9, 1936, *Steyermark 10389.*

Festuca rubra var. lanuginosa Mert. & Koch. This grass has just been introduced into the state in lawn grass seed, and numerous plants have established themselves around the University City Senior High School in University City, St. Louis Co., May 6, 1936, *Steyermark 10339.*

Elymus riparius Wiegand. This species was found to be quite common in several sections of the southeastern Ozarks and was collected from the 3 counties of Dent, Shannon, and Butler. Along banks of Current river, just south of Paint Rock bluff, Shannon Co., July 26, 1936, *Steyermark 12292;* around top of sw.-facing limestone bluffs at Paint Rock bluff, along Current river, 8 mi. south of Exchange, Shannon Co., July 26, 1936, *Steyermark 12310;* openings in thickets along beaver-dam on north prong (Hutchins Creek) of Meramec river, between Stone Hill and Indian Trail State Park, T 34 N, R 4 W, sect. 11, Dent Co., Aug. 4, 1936, *Steyermark 12544;* upper cherty slopes bordering Mud Creek, 2 mi. northwest of Rombauer, T 26 N, R 7 E, sect. 20, Butler Co., July 7, 1936, *Steyermark 11360.*

Aristida longespica Poir. var. geniculata (Raf.) Fern. Sterile open woods, 4 mi. west of junction of highways no. 14 and no. 67, in Butler Co., Oct. 18, 1936, *Steyermark 20468.*

Digitaria Ischaemum Schreb. var. mississippiensis (Gattinger) Fern. Collected in Phelps County.

Panicum calliphyllum Ashe. This rare species, hitherto unknown west of Ohio, was collected on dry cherty slopes of an oak-southern yellow pine association in the southeastern section of the Ozarks. Upper cherty slopes along Current river, 2 mi. below mouth of Wells creek, T 23 N, R 2 E, sect. 8, 7 mi. northwest of Doniphan, Ripley Co., Oct. 19, 1936, *Steyermark 20507.*

Panicum oligosanthes Schult. This species was omitted from the annotated catalogue of Missouri plants above referred to, because no

authentic specimen had been examined. However, Mrs. Chase has reported, in a letter to the writer, a specimen of this species from Greene County in the U. S. National Herbarium. This record is now substantiated by the author's discovery of this species from 3 additional southern Missouri counties. Top of sandstone bluffs along Mississippi river, 2 mi. north of Commerce, Scott Co., Nov. 7, 1936, *Steyermark 20749;* pine woods along fork of Little Piney river east of Piney Spring, Phelps Co., Nov. 28, 1936, *Steyermark 20901;* limestone slopes along North Fork of White river, near Rainbow (Double) Spring, 4 mi. southeast of Dora, Ozark Co., May 16, 1936, *Steyermark 10473.*

PANICUM VILLOSISSIMUM Nash var. PSEUDOPUBESCENS (Nash) Fern. Cherty upland woods of ravine, tributary to Grand Glaize branch of Lake-of-the-Ozarks, 3 mi. southwest of Brumley, Miller Co., Oct. 25, 1936, *Steyermark 20685.*

ELEOCHARIS EQUISETOIDES (Ell.) Torr. This adds another one of the southern species to the already large list of such to reach Missouri. The sink-hole pond in which it was growing in a large colony shares, with other similar ponds scattered over the dry uplands of southern Missouri, the distinction of harboring many rare and unique species of aquatic and marsh plants not found elsewhere in the state. Growing here with it were *Brasenia Schreberi* and *Nyssa aquatica*, the latter isolated here in the upland at its western limit in Missouri, and separated from its nearest swamp habitat in the southeastern lowlands to the east by a distance of almost one hundred miles. Tupelo Gum Pond, T 25 N, R 4 W, sect. 4, 9 mi. west of New Liberty, Fristoe Purchase Unit, Clark National Forest, July 24, 1936, *Steyermark 12266.*

ELEOCHARIS WOLFII Gray. This rare species of the central states was found by the author in the glaciated region of northern Missouri. Uncommon around swale in bottom prairie along East Yellow creek, 6 mi. east of Brookfield, Linn Co., June 5, 1936, *Steyermark 11028.*

SCIRPUS SUBTERMINALIS Torr. The discovery of this northern species isolated in a wild remote spring-fed stream in southern Missouri adds another such relic to the flora. Other northern relics, similarly isolated in the Ozarks, are *Galium boreale* var. *hyssopifolium*, *Campanula rotundifolia*, *Zigadenus elegans*, *Menyanthes trifoliata*, and *Liparis Loeselii.* In still water of White's creek, Irish Wilderness, T 24 N, R 2 W, sect. 17, 4 mi. south of Wilderness, Oregon Co., Fristoe Purchase Unit, Clark National Forest, July 20, 1936, *Steyermark 12054.*

CAREX ALATA Torr. This elegant species was common in various sink-hole ponds of Oregon and Howell Counties where its tall quadrangular culms and large tussocks shared company with the also tussock-forming *Carex decomposita* and *Carex comosa.* Forming tussocks in Brushy Pond, 2 mi. south of CCC Camp F-8, T 25 N, R 3 W, sect. 18, 3 mi. southwest of New Liberty, Oregon Co., Fristoe

Purchase Unit, Clark National Forest, July 24, 1936, *Steyermark 12263;* crotches of *Cephalanthus* bushes in swamp between Moody and Southfork, Howell Co., June 9, 1933, *Steyermark 9542.*

Carex suberecta (Olney) Britton. Marly swampy meadow along Bee Fork, 5 mi. east of Bunker, T 32 N, R 2 W, sect. 23, Reynolds Co., Clark Purchase Unit, Clark National Forest, Aug. 5, 1936, *Steyermark 12570;* limestone ledges along creek in Barn Hollow Canyon, 5 mi. southeast of Arroll, Texas Co., May 26, 1935, *Steyermark 19128.*

Carex molesta Mack. Prairie between Tipton and Fortuna, Moniteau Co., May 23, 1936, *Steyermark 10616;* grassy slopes bordering Osage river, at Duroc, Benton Co., May 24, 1936, *Steyermark 10721.*

Carex communis Bailey. This species was found in the White River territory of southwestern Missouri and is represented by the author's following collections: wooded limestone slopes below Table Rock along White River, Taney Co., April 25, 1936, *Steyermark 10116;* half way up wooded limestone slopes along White river, east of Smith Ford, south of Shell Knob, Barry Co., April 26, 1936, *Steyermark 10229.*

Carex gracilescens Steud. On north-facing wooded slopes of Crowleys Ridge between Benton and New Hamburg, Scott Co., May 2, 1936, *Steyermark 10299.*

Carex substricta (Kükenth.) Mack. Along wooded bank of Ten Mile creek, T 26 N, R 3 E, sect. 36, 4 miles southeast of Ellsinore, Carter Co., Wappapello Purchase Unit, Clark National Forest, July 13, 1936, *Steyermark 11735.*

Sisyrinchium atlanticum Bicknell. This species grew in numerous dense clumps on a sandy prairie in the lowlands of southeastern Missouri. The decidedly glaucous leaves and stems, the latter conspicuously forking and bearing elongate peduncles, mark this species very well in the field. The discovery of this species in Missouri adds another one of the coastal plain-Mississippi Embayment species to the flora and marks the present northwestern limit of this species. Sandy prairie, 2 mi. west of Charleston, west of Charleston Cemetery, Mississippi Co., May 2, 1936, *Steyermark 10294.*

Liparis Loeselii (L.) L. C. Rich. This is the first authentic collection of this species from the state, other reports having been based upon erroneous records or misidentified material. The plant was found in wet thickets of an alder swamp (*Alnus rugosa*) with *Cirsium muticum*, *Aster puniceus* var. *lucidulus*, and *Pedicularis lanceolata.* This moist habitat appears quite characteristic for the species, whereas *Liparis liliifolia* is always found growing in Missouri in dry woods or on rocky slopes or ledges. In swampy alder thicket along Big creek, T 31 N, R 2 W, sect. 5, Shannon Co., Clark Purchase Unit, Clark National Forest, Sept. 26, 1936, *Steyermark 20123.*

Populus tremula L. Near Palmer, T 36 N, R 1 W, sect. 13, Aug. 18, 1936, *Steyermark 12997.* This species of the Old World has

established itself plentifully in this area in Washington county, Missouri.

FAGUS GRANDIFOLIA var. CAROLINIANA (Loud.) Fern. & Rehd. f. MOLLIS Fern. & Rehd. Along Castor river, north of Gipsy, Bollinger Co., July 12, 1936, *Steyermark 11689.*

QUERCUS SCHUETTEI Trelease (*Q. macrocarpa* × *bicolor*). Growing among the parent species in low alluvial woods along Monegaw creek near Monegaw Springs, St. Clair Co., Oct. 3, 1936, *Steyermark 20216.*

BOEHMERIA CYLINDRICA var. DRUMMONDIANA Wedd. (*B. cylindrica* var. *scabra* Porter). Wet meadow along Big creek, T 31 N, R 3 W, sect. 5, 2 mi. south of Melton, Shannon Co., Clark Purchase Unit, Clark National Forest, Aug. 7, 1936, *Steyermark 12716.*

ARENARIA LATERIFLORA L. Although this species has heretofore been reported for the state, this constitutes the first extant collection on record. Low woods along fork of Wyaconda river, between Arbela and Azen, Scotland Co., May 30, 1936, *Steyermark 10808.*

DENTARIA LACINIATA Muhl. var. LATIFOLIA Farwell. Low woods along White river, west of Table Rock, Taney Co., April 25, 1936, *Steyermark 20138* and *20138a.* This extreme of the species is well marked by its very large and broadly cut leaves.

HEUCHERA PUBERULA × HEUCHERA AMERICANA var. HIRSUTICAULIS. Plants which were referred to this status by Dr. Rosendahl and Dr. Butters were found in Wayne and Madison Counties within fifty miles of one another along the St. Francois river in southeastern Missouri. Hall's Bluff, along St. Francois river, 4 mi. south of Kime, T 27 N, R 6 E, sect. 5, Wayne Co., July 9, 1936, *Steyermark 11542;* crevices of limestone bluffs along St. Francois river, between mouth of Captain creek and bridge over highway to Jewett, Madison Co., Nov. 15, 1936, *Steyermark 20980.*

OXALIS EUROPAEA Jord. var. BUSHII (Small) Wieg. f. VESTITA Wieg. Rocky wooded slopes of Virgin Bluff, along James river, 2 mi. south of Cape Fair, Stone Co., May 9, 1936, *Steyermark 10347.*

EUPHORBIA COROLLATA var. MOLLIS Millsp. This hairy extreme of typical *Euphorbia corollata* is often encountered on limestone glades and barrens. Limestone glade on top of bluffs along Moreau river, 1½ mi. southeast of Jefferson City, Cole Co., Aug. 18, 1937, *Steyermark 24902;* limestone glade on bluffs of Gasconade river, 1½ mi. west of Jerome, Phelps Co., Aug. 26, 1937, *Steyermark 25345;* limestone glade along Niangua river, 5 mi. southwest of Long Lane, 2 mi. north of Hico, Dallas Co., Aug. 5, 1937, *Steyermark 24249.*

THASPIUM TRIFOLIATUM (L.) Gray. Plants of this species were collected during 1936 by Mr. George Moore in Laclede Co. All the vegetative and floral parts were purplish.

HYDROCOTYLE VERTICILLATA Thunb. For years species of this genus have been sought in vain in Missouri, and although reports of the genus were attributed to the state by several authors, no actual

specimens had ever been found. By happy chance while collecting along the North Fork of White river in Ozark County, southern Missouri, the author found this species locally abundant along springs seeping out along this stream about fifteen miles north of the Arkansas line. This is the first actual record of this genus from Missouri, and this statement is verified by Dr. Mildred Mathias Hassler, the present monographer of the genus. Along North Fork of White river, north of Rainbow (Double) Spring, 4 mi. southeast of Dora, Ozark Co., July 18, 1936, *Steyermark 11982;* same locality, May 16, 1936, *Steyermark 10400.*

Menyanthes trifoliata L. var. minor Michx. The discovery of this species in a limey bog in Reynolds county in southeastern Missouri extends the range of this species considerably southwestward. The marshy meadow in which this was found was fed by a small spring whose seepage kept the area perpetually moist and harbored an abundance of *Rynchospora capillacea, Carex subercta, Galium tinctorium* (*G. Claytoni*), *Fuirena simplex,* and *Parnassia grandifolia.* Marly bog along north prong of Bee Fork, 5 mi. east of Bunker, T 32 N, R 2 W, sect. 23, Reynolds Co., Clark Purchase Unit, Clark National Forest, Aug. 5, 1936, *Steyermark 12564.*

Mimulus ringens L. × Mimulus alatus Ait. Hybrids of these species were collected commonly in various parts of southeastern Missouri wherever both species occurred, as in Crawford, Ste. Genevieve, Shannon, and Reynolds Counties.

Solidago Riddellii Frank. This species, although reported for Missouri, was not included in the annotated catalogue of Missouri plants because no authentic specimens had been examined. There is a plant of this species in the Missouri Botanical Garden Herbarium which was doubtfully collected in St. Louis by Nicholas Riehl in the early part of the nineteenth century. During the autumn of 1936 the author found this species occurring in several swampy meadows in Dent and Shannon Counties in the southeastern Ozarks, and these constitute the first definite records for the state. Swampy meadow along Little Sinking creek, T 32 N, R 3 W, sect. 34, near Melton, in Dent Co., Sept. 26, 1936, *Steyermark 20129.*

Aster puniceus L. var. lucidulus Gray. This aster was found growing plentifully in swampy meadows in Dent, Reynolds, Shannon, and Howell Counties in the southern Ozark region. It was associated with *Solidago Riddellii, Pedicularis lanceolata,* and *Solidago rugosa* var. *aspera.* The stems in this variety varied from more or less densely crisp-pubescent to glabrate. Wet meadow along Big creek, 2 mi. south of Melton, T 31 N, R 3 W, sect. 5, Shannon Co., Clark Purchase Unit, Clark National Forest, Aug. 7, 1936, *Steyermark 12689.*

Aster laevis L. var. amplifolius Porter. This broad-leaved extreme of the species was collected in Saline, Reynolds, and Cape Girardeau Counties. Wooded bluffs along Missouri river escarpment

at Miami, Saline Co., Oct. 11, 1936, *Steyermark 20435;* upper wooded top of limestone bluffs at east end of Hickory Ridge, 1 mi. west of Delta, Cape Girardeau Co., Nov. 8, 1936, *Steyermark 20788.*

Field Museum of Natural History,
Chicago, Illinois

THE OSCILLATORIACEAE OF SOUTHERN MASSACHUSETTS

Francis Drouet

(*Continued from page 241*)

PHORMIDIUM Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 156 (1892).—The diffluence of sheaths in this genus is a character often of too qualitative a nature for the beginner to recognize at first sight. It is evidenced macroscopically, however, in the tenacious character of the plant masses; whereas species of Oscillatoria form plant masses which are so fragile that they do not retain the original shape when lifted from the habitat, it is only rarely that the plant mass of a species of Phormidium breaks or loses form when lifted from its habitat. Microscopically the presence of amorphous jelly can be demonstrated easily by staining with dilute aqueous solutions of various dyes. A number of widely distributed species of this genus in North America are omitted here because of lack of specimens from southern Massachusetts. Among these are *P. purpurascens* (Kütz.) Gom., *P. laminosum* (Ag.) Gom., *P. Treleasei* Gom., *P. inundatum* Kütz. ex Gom., *P. Setchellianum* Gom., *P. favosum* (Bory) Gom., *P. subfuscum* (Ag.) Kütz. ex Gom., *P. uncinatum* (Ag.) Gom., and *P. penicillatum* Gom. *P. favosum* as distributed in Phyc. Bor.-Amer. 1652 is treated here as *P. autumnale.*

Key to Species

I. Trichomes torulose, apices not calyptrate
  A. Trichomes narrow (less than 4 μ in diameter)
    1. Plant-mass growing within the sheaths of other algae or small animals.—Stratum small, pale or yellowish blue-green, in fresh water; filaments short (to 50 μ long), straight, often parallel; sheaths usually entirely diffluent or thin and hyaline, not coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green, 1.3–2 μ in diameter; cells as long as or twice as long as wide; protoplasm finely granulose; apical cell rotund above, rarely obtuse-conical . . . . . *P. mucicola*
    2. Plant-mass not within the sheaths of other algae or animals
      a. Plants of salt or brackish water, rarely in fresh water; trichomes very small (less than 2.5 μ in diameter)
        (I) Stratum thin, rose-colored, in salt water; filaments loosely intertwined; sheaths thin or entirely diffluent into an amorphous mucus,

not coloring blue when treated with chlor-zinc-iodine; trichomes pale rose-colored, attenuate at the apices, 1.7–2 μ in diameter; cells 2–7 μ long; rarely quadrate; protoplasm homogeneous; apical cell acute-conical..... *P. persicinum*

(II) Stratum mucous, lamellose, yellowish or brownish-green, in brackish or hot water; sheaths hyaline, diffluent into an apparently fibrous mucus, not coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, variously interwoven or parallel, attenuated at the apices, 1.2–2.3 μ in diameter; cells subquadrate, 1.2–3 μ long; protoplasm not granulose; apical cell acute-conical..... *P. fragile*

b. Plants of fresh water; trichomes larger (2.5–4 μ in diameter).—Stratum thin-laminose, mucous, bright blue-green; sheaths diffluent into an amorphous mucus, not coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, straight or almost so, parallel or variously intricated, not attenuate at the apices, 2.7–3.3 μ in diameter; cells cylindrical or barrel-shaped, quadrate or twice as long as wide, 3–7.8 μ long; protoplasm coarsely granulose; apical cell rotund..... *P. molle*

B. Trichomes broad (more than 4 μ in diameter).—Plant-mass penicillate, attached by a basal stratum in fresh water, the free portion elongate, gelatinous, dark blue-green, yellowish-violet when dried; filaments more or less straight, parallel, closely agglutinated; sheaths often evident, mucous and usually entirely diffluent, not coloring blue when treated with chlor-zinc-iodine; trichomes pale blue-green (yellowish-violet when dried), straight and often long-attenuate at the apices, 6–8.5 μ in diameter; cells quadrate or longer than wide (rarely to half as long as wide), 3–11 μ long; protoplasm finely granulose; cross-walls never granulated; apical cell more or less acute-conical or cylindric-conical..... *P. tinctorium*

II. Trichomes not constricted at the cross-walls, at least not torulose except in certain species in which calyptras are present

A. Trichomes not conspicuously calyptrate; apical cell never enlarged and capitate

1. Plant-mass violet, in fresh water; sheath material not coloring blue when treated with chlor-zinc-iodine.—Stratum membranaceous, lamellose, blue-violet or blackish-violet above, gray-green beneath; filaments straight, parallel or intermeshed; sheaths at first thin, scarcely evident, later entirely diffluent into an amorphous jelly; trichomes straight and not attenuate, fragile, very slightly constricted at the cross-walls, 1.7–2 μ in diameter; cells subquadrate or longer than wide, 1.8–4.7 μ long; protoplasm not granulose; cross-walls not granulated; apical cell rotund, without calyptra..... *P. luridum*

2. Plant-mass not violet

a. Trichomes narrow (usually less than 4.5 μ in diameter)

(I) Stratum bright blue-green, membranaceous, expanded; filaments elongate, more or less straight, closely intermeshed; sheaths thin, diffluent into an apparently fibrous mucus, coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, not at all or very slightly constricted at the cross-walls, often indistinctly articulated, at first straight then uncinate and attenuate at the apices, 1–2 μ in diameter; cells 2.5–5 μ long; protoplasm homogeneous; apical cell often acute-conical, without calyptra.....*P. tenue*

(II) Stratum lubricous, expanded, lamellose, up to 3 cm. thick, dirty green above, colorless beneath; filaments flexuous, closely interwoven; sheaths well defined and papery, later diffluent into a tenacious mucus, coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, straight at the apices, not attenuated, never constricted at the cross-walls, 2–2.5 μ in diameter; cells longer than wide, 3.3–6.7 μ long; protoplasm finely granular, the cross-walls marked with two or four granules; apical cell rotund, without calyptra.....*P. valderianum*

(III) Stratum blackish or brownish-green, expanded, membranaceous, coriaceous; filaments elongated, more or less flexuous, closely interwoven; sheaths thin, distinct, or diffluent into an amorphous mucus coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, not constricted at the cross-walls, briefly attenuated, 3–4.5 μ in diameter; cells subquadrate to twice as long as wide, 3.4–8 μ long; protoplasm seldom granulose; cross-walls usually conspicuous, not granulated; apical cell acute-conical, without calyptra.....*P. Corium*

(IV) Stratum blackish-green or blue-green, expanded, shining, thin but tough, fragile when dried, in fresh or somewhat brackish water; filaments elongate, rather flexuous, very closely interwoven; sheaths thin and papery or entirely diffluent, coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, slightly or not at all constricted at the cross-walls, straight and briefly attenuate at the apices, 3–5 μ in diameter; cells subquadrate or shorter than wide, 2–5 μ long; protoplasm often granulose; cross-walls conspicuous, never granulated; apical cell obtuse-conical, without calyptra. *P. papyraceum*

b. Trichomes broad (seldom found less than 4.5 μ in diameter)

(I) Plant mass bright blue-green or bluish-black, thick, compact, or rarely fasciculate-penicillate and attached at the base, in fresh water; filaments more or less straight, fragile; sheaths thin, usually more or less diffluent

into an amorphous mucus, not coloring blue when treated with chlor-zinc-iodine; trichomes blue-green, not constricted at the cross-walls, or only so at the apices, rarely here and there almost torulose, straight and briefly attenuate at the apices, 4.5–12 μ in diameter; cells longer or shorter than wide, 4–8 μ long; protoplasm coarsely granulose; cross-walls conspicuous, usually ungranulated; apical cell briefly and scarcely attenuate, truncate, with a slightly thickened outer membrane ..... *P. Retzii*

(II) Stratum expanded, bright blue-green, yellowish-green, or blackish, in fresh (and slightly brackish) water; filaments elongated, flexuous, variously interwoven; sheaths firm or mucous and diffluent, in some collections thick and lamellose, coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green, slightly constricted at the cross-walls, straight and not attenuate at the apices, 4–6 (–7) μ in diameter; cells 1.5–2.7 μ long; protoplasm usually rather coarsely granulose; cross-walls rarely granulated; apical cell rotund, its outer wall somewhat thickened ..... *P. ambiguum*

B. Trichomes conspicuously calyptrate; apical cell in some species enlarged and capitate

1. Cells of most trichomes of the plant-mass quadrate and shorter than wide.—Stratum expanded, fragile, dark blue-green, often yellowish-brown, subaerial or aerial in freshwater or secondarily brackish habitats; filaments straight, fragile, parallel, or variously intertwined; sheaths well defined, mucous, or diffluent into an amorphous jelly, never coloring blue when treated with chlor-zinc-iodine; trichomes blue-green or olive-green, never constricted at the cross-walls, capitate, briefly attenuate and scarcely curved or straight at tha apices, 4–7 μ in diameter; cells 2–5 μ long; protoplasm granulose; cross-walls frequently granulated; apical cell enlarged, bearing a more or less rotund calyptra ..... *P. autumnale*

2. Cells of most trichomes of the plant-mass quadrate or longer than wide.—Stratum membranaceous, coriaceous, dark green or bright blue-green, in salt water; filaments straight or variously contorted, often parallel or intermeshed; sheaths thin, often distinct and imbedded in an amorphous mucus, or as often wholly diffluent, not coloring blue when treated with chlor-zinc-iodine; trichomes bright blue-green (rarely lead-colored in dried material), constricted at the cross-walls, often distinctly torulose, straight and perceptibly long-attenuate at the apices, often almost capitate, 2.7–5.5 μ in diameter; cells subquadrate to twice as long as wide, 3–10 μ long; protoplasm finely granulose; cell-walls never granulated; apical cell obtuse-conical, bearing a depressed-conical calyptra ..... *P. submembranaceum*

PHORMIDIUM MUCICOLA Naum. & Huber in Huber-Pestalozzi & Naumann, Ber. d. d. bot. Ges. **47**: 68, f. 1–6 (1929).—Thus far observed in southern Massachusetts only in the sheaths of *Microcystis aeruginosa* Kütz. Dr. G. Huber-Pestalozzi has obligingly compared a duplicate of the second collection cited below with the original material of this species, which besides having been found at several stations in Europe has been reported by Rich from Kenya Colony in Journ. Linn. Soc. Zool. **38**: 271 (1933). I shall treat specimens from Argentina in another publication. The trichomes in our material are pale blue-green and often give one reason to suspect that they are rod-shaped bacteria, though masses of trichomes in the same Microcystis colony have a definite blue-green color. In well delimited colonies of Microcystis, the filaments occur in small numbers in the periphery of the jelly. A correlation appears to exist between the degree of diffluence of the sheaths and the number of Phormidium filaments present. In colonies which have become almost entirely dissociated, the filaments are often more numerous than the Microcystis cells. Where many Phormidium filaments are present, the cells of Microcystis often contain neither conspicuous pseudovacuoles nor evident cell membranes and acquire the yellowish-green color associated with the death of the organisms. From similar observations, the authors of the species supposed *P. mucicola* to be at least partially parasitic and ultimately to cause the death of the 'host' cells. Geitler in Rabenh. Kryptogamen-Fl. **14**: 999 (1932) has pointed out that the death of these cells may be due to other factors and that the Phormidium filaments may multiply and occupy the entire jelly of the 'host' colony only because the 'host' cells have disappeared from it. Specimens seen from the United States: MASSACHUSETTS: Falmouth: Coonamesset Pond, Hatchville, *H. Croasdale*, 4 Aug. 1934 (D, F, N, S, T, W); Oyster Pond, *E. T. Rose*, 17 June 1936 (D, Huber-Pestalozzi); 'Episcopal Ocean,' *A. Cohen & Drouet 1910*, 12 Aug. 1936 (D). INDIANA: with and sub. nom. *Microcystis aeruginosa*, Winona Lake, *C. M. Palmer*, 30 Aug. 1935 (D). MICHIGAN: McDonald Lake, Hastings, *G. T. Velasquez 16*, 4 Aug. 1936 (D, F, T, Y, Herb. Univ. Mich., Velasquez). IOWA: plankton from Center Lake, *G. W. Prescott 317*, 10 July 1925 (D, F); Miller's Bay, Lake Okoboji, *Prescott 316*, 30 June 1925 (D); Lake East Okoboji, *Prescott 338*, 24 June 1926 (D, N, S).

PHORMIDIUM PERSICINUM (Reinke) Gom., Ann. Sci. nat. VII Bot. **16**: 164 (1892); Davis, Phyc. Bor.-Amer. **29**: 1401 (1907), in certain specimens distributed; Tilden, Minn. Alg. **1**: 94 (1910), in part; Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913), in part.—*Fig. 6.* If a normal constituent of the flora, rarely observed or rarely attaining conspicuous growth. Some duplicate specimens of the one collection cited below contain very little if any of this species; for example, that in the Herbarium of W. R. Taylor consists almost entirely of *Oscillatoria laetevirens.* Three sheets of a collection, two in the Farlow Herbarium and one in the New York Botanical Garden, 'forming thin

layers on the glass of a marine aquarium, Woods Holl, *Trelease*, 28 Sept. 1881,' contain a small form with trichomes somewhat similar to *P. Ectocarpi* Gom, Bull. Soc. Bot. France **46**: 37 (1899), as described; but the sheaths do not color blue when treated with chlor-zinc-iodine. M. Gomont apparently saw a duplicate of this material, for one sheet in the Farlow Herbarium is annotated in Prof. Farlow's handwriting with an extract from a letter from Gomont in 1907: "Me paraît un petit Phormidium voisin de Ph. Ectocarpi Gom., Nostoc. Homo., mais la couleur différent." I am not in a position to place this material with certainty and therefore omit it here. One collection of *P. persicinum*: FALMOUTH: in a jar in the Marine Biological Laboratory, Wood's Hole, *B. M. Davis*, May 1907 (Phyc. Bor.-Amer. 1401, N, W, Y, in part; not T).

PHORMIDIUM FRAGILE (Menegh.) Gom., Ann. Sci. nat. VII Bot. **16**: 163, pl. iv, f. 13–15 (1892). [?] *P. tenue* of Hazen, RHODORA **26**: 211 (1924); Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935), in part, not Gom.—Apparently confined here to saline and subsaline habitats, and often confused with *P. tenue*. The Fairhaven material is similar to that of a specimen determined by Gomont in the Farlow Herbarium, MAINE: Seal Harbor, *F. S. Collins 1867*, July 1891; the Penikese specimens are referred here though many trichomes in the masses have cells somewhat longer than broad. Specimens seen: FAIRHAVEN: tide-pools on Black Rock, *W. R. Taylor*, 31 July 1917 (T); Sconticut Point, *Drouet 2176*, 1 Sept. 1937 (D, F, N, S). GOSNOLD: on rocks in a tide pool, Penikese Island, *J. Cohn*, 10 July 1934 (D, Y); Botanical Survey of Penikese Island, 24 July 1923 (W).

PHORMIDIUM MOLLE (Kütz.) Gom., Ann. Sci. nat. VII Bot. **16**: 163, pl. iv, f. 12 (1892).—*Fig. 7*. Known from a single specimen: BOURNE: Iron Works Pond, *F. S. Collins*, 6 Aug. 1915 (N).

PHORMIDIUM TINCTORIUM Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 162, pl. iv, f. 11 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 19 (1935). Authentic material: Rabenh. Alg. 1994 (F); Desmaz., Pl. cryptog. France, éd. I, 1969 (F).—One collection: GOSNOLD: penicillate tufts attached to decaying sticks in a well-hole the water of which empties into Sheep Pond, Cuttyhunk Island, *Drouet 1004*, 1 July 1930 (T, D).

PHORMIDIUM LURIDUM (Kütz.) Gom., Ann. Sci. nat. VII Bot. **16**: 165, pl. iv, f. 17, 18 (1892). Authentic material: Desmaz., Pl. cryptog. France, sér. II, 129 (F).—Known from one station: FALMOUTH: lining concrete tanks beneath benches in greenhouse south of railroad station, Woods Hole, *Drouet 1931*, 27 Aug. 1936 (D, F, T, Y).

PHORMIDIUM TENUE (Menegh.) Gom., Ann. Sci. nat. VII Bot. **16**: 169, pl. iv, f. 23–25 (1892); Nott, Phyc. Bor.-Amer. **13**: 606 (1899), at least in part; Tilden, Minn. Alg. **1**: 98 (1910); Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935); not of Hazen, RHODORA **26**: 211 (1924). *P. angustissimum* of Croasdale, ibid. 19 (1935), not West & West f., ex char. Authentic material: Rabenh. Alg. 268 (F),

1730 (F, T).—Often seen in fresh water and very rarely in slightly brackish water. Phyc. Bor.-Amer. 606 consists of a considerable number of species of algae not carefully dried and partially overgrown by fungi. The masses of trichomes purported to be *P. tenue* are at most in a juvenile state and are scarcely sufficiently large for critical study. Morphologically the trichomes seem referable rather to *P. tenue* than to *P. angustissimum* as described. Specimens seen: FALMOUTH: on sides of a watering-trough, Woods Hole, *Drouet 1905*, 5 Aug. 1936 (D, F, S, T, Y). GOSNOLD: Deer Pond, Nonamesset Island, *H. Croasdale*, 2 July 1934 (D, Y); pool, east shore of Naushon Island, *C. P. Nott*, 9 Aug. 1895 (W, *Specim. mancum*); in fresh water, Naushon Island, *C. P. Nott*, 9 Aug. 1895 (Phyc. Bor.-Amer. 606, W, T, Y, *specim. manca*).

PHORMIDIUM VALDERIANUM Gom.,[12] Ann. Sci. nat. VII Bot. **16**: 167, pl. iv, f. 20 (1892). Authentic material: Rabenh. Alg. 577 (F), 2458 (F); Hauck & Richt., Phyk. univ. 29 (F).—In fresh water. In the authentic material cited above, in the many specimens of this species from Europe and America studied during preparation of this paper, and in Gomont's illustration (loc. cit.) of this species, I have been unable to discover the constrictions of the trichomes as described by Copeland, Ann. New York Acad. Sci. **36**: 179 (1936). The material which Croasdale reported as 'rare' in Chara Pond near Woods Hole in her *Fresh Water Alg. Woods Hole, Mass.*, 20 (1935), has been lost; I have not had the opportunity to examine it. The one collection seen lined a trough through which hot and cold water ran intermittently: FALMOUTH: Ice House Pond, *E. T. Rose*, 25 June 1936 (D, F, T, Y).

PHORMIDIUM CORIUM (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **16**: 172, pl. v, f. 1, 2 (1892). Authentic material: Rabenh. Alg. 294 (F, T), 392 (F).—Growing subaerially in leathery sheets, or in thick compact strata beneath the surface of fresh water. *P. inundatum*, *P. papyraceum*, and *Symploca muralis* are sometimes confused with this species. Specimens seen: FAIRHAVEN: lining walls of a cow-trough and well by Highway 6 east of Fairhaven, *E. T. Rose & Drouet 1889*, 18 July 1936 (D, F, T, Y). TISBURY: on stones in springy margins of south end of Lake Tashmoo, *G. Velasquez & Drouet 1894*, 21 July 1936 (D, S).

PHORMIDIUM PAPYRACEUM (Ag.) Gom., Ann. Sci. nat. VII Bot. **16**: 173, pl. v, f. 3, 4 (1892). Authentic material: Wittr. & Nordst., Alg. exs. 776a, b (F); Rabenh. Alg. 2089 (F); Hauck & Richt., Phyk. univ. 223 (F).—Forming dark blue-green sheets in almost fresh water of high tide pools (diluted with rain water), or in comparable situations in which the salt content of the water is low. Specimens in herbaria come also from strictly freshwater habitats. *P. papyraceum* is reported by Taylor, RHODORA 26: 212 (1924), from Penikese Island; unfortunately the specimen has been misplaced. Specimens seen:

[12] This name is incorrectly written *P. valderianum* (Delp.) Gom. in recent phycological literature.

Fairhaven: in high tide pools, Sconticut Point, *Drouet 1879, 1880,* 15 July 1936 (D, F, S, T, Y).

Phormidium Retzii (Ag.) Gom. ex Ann. Sci. nat. VII Bot. **16:** 175, pl. v, f. 6–9 (1892); Collins, Phyc. Bor.-Amer. **35:** 1710 (1911); not of Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935). Authentic material: Kütz. Dec. 15 (F); Moug. & Nestl., Stirp. crypt. vogeso-rhenanae 1375 (F).—One collection seen: eastham: forming sheaths on stalks of plants in shallow water, Great Pond, *F. S. Collins,* 9 Sept. 1910 (Phyc. Bor.-Amer. 1710, W, T, Y).

Phormidium ambiguum Gom., Ann. Sci. nat. VII Bot. **16:** 178, pl. v, f. 10 (1892). *Lyngbya semiplena* of Nott, Phyc. Bor.-Amer. **30:** 1452a (1908); not of Setchell, idem 1452b (1908); not J. Ag. ex Gom. Authentic material: Rabenh. Alg. 75 (F, T), 265 (F), 1956 (F); Wittr. & Nordst., Alg. exs. 492 (F).—Specimens seen, all apparently from fresh water: falmouth: on stones in running water flowing from pond to the sea, 'Megantic,' Buzzards Bay, *W. G. Farlow,* Aug. 1913 (F); on mud and debris in shallow water, Wood Pond, Woods Hole, *Drouet 1107,* 23 June 1934 (D, F, T, Y); ditch, Falmouth, *C. P. Nott,* 20 July 1895 (W), July 1895 (Collins, N. Amer. Alg. 12, D), undated (Phyc. Bor.-Amer. 1452a, not b, W, T, Y).

Phormidium autumnale (Ag.) Gom., Ann. Sci. nat. VII Bot. **16:** 187, pl. v., f. 23, 24 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 20 (1935). *P. favosum* of Collins, Phyc. Bor.-Amer. **34:** 1852 (1910), not Gom. *Lyngbya hahatonkensis* Drouet,[13] Bot. Gaz. **95:** 698, f. 5 (1934). Authentic material: Kütz. Dec. 94 (F); Rabenh. Alg. 2537 (F); Hauck & Richt., Phyk. univ. 233 (F).—Often developing on soil in and about temporary rain pools, rarely in subaerial subsaline habitats, and not seldom appearing in soil cultures. Specimens seen: eastham: forming a thin glossy coating on wall of a spring at high water mark, shore of Salt Pond, *F. S. Collins,* 11 Sept. 1910 (Phyc. Bor.-Amer. 1652, W, T, Y). Falmouth: subaerial on wet soil behind Zoology Building, Woods Hole, *Drouet 1926,* 22 Aug. 1936 (D, F, T, Y); in clay drain pipe beside Eel Pond, Woods Hole, *Drouet 1183,* 30 July 1934 (D); on wet earth in greenhouse south of railroad station, Woods Hole, *Drouet 1932,* 27 Aug. 1936 (D); damp ground near a pump, Wood's Holl, *W. A. Setchell,* July 1894 (W); on wet soil in greenhouse at railroad station, Falmouth, *Drouet 1936,* 29 Aug. 1936 (D); in greenhouse by State Road at Church Street, Woods Hole, *Drouet 1930,* 26 Aug. 1936 (D).

Phormidium submembranaceum (Ard. & Straff.) Gom., Ann. Sci. nat. VII Bot. **16:** 180, pl. v, f. 13 (1892); Osterhout & Gardner, Phyc.

[13] The type material of this species, missouri: Hahatonka, *Drouet 148,* 9 Aug. 1928, in Herb. F. Drouet, should more reasonably be considered an ecological or growth form of *P. autumnale* than a species of Lyngbya. The shortness of the cells can easily be attributed to a high rate of cell division taking place in a rapidly developing plant mass. The trichomes in other respects appear to be identical with authentic material of *P. autumnale.* Thick and mucous sheaths are seen in other material of this species growing in almost or partially submersed habitats.

Bor.-Amer. **24**: 1162 (1904); Tilden, Minn. Alg. **1**: 104 (1910); Geitler, Rabenh. Kryptogamen-Fl. **14**: 1023 (1932); Frémy, Mém. Soc. nat. Sci. nat. & math. Cherbourg **41**: 91 (1834). *Oscillatoria* (*Oscillaria*) *subtorulosa* Farlow (as to specimens, not as to name-bearing synonym of *Phormidium subtorulosum* Bréb. ex Gom.) apud Tilden, Minn. Alg. **1**: 83 (1910); Farlow, Mar. Alg. New Engl., 33 (1891); not of Davis, Bull. U. S. Bur. Fish. 1911(2): 797 (1913).—In a letter to Prof. Farlow presumably written in August, 1899, M. Gomont speaks of the former's collection from Eastport, Maine, labeled *Oscillaria subtorulosa*, a portion of which he examined and returned:[14] "Votre plante est un Phormidium, épais de 3–4 μ, à articles carré, à extrémité droite, avec un coiffe. Il ressemble beaucoup au Phormidium submembranaceum (Oscill. Ardissone) et je crois qu'on peut le réunir à cette espèce dont je n'ai vu qu'un seul echantillon, celui d'Ardissone." This specimen and other New England material appear to be exactly similar in every morphological detail except range in size to Phyc. Bor.-Amer. 1162 from California, the apparent basis for the citation of this species from North America by Geitler, loc. cit., and by Frémy, loc. cit. The species is one of truly marine waters, often found mixed with other algae on piers, wharves, barnacles, and rocks both between and below tide marks. Prof. Frémy has examined a portion of Farlow's material of *O. subtorulosa*. Specimens seen from North America: MAINE: Eastport, *W. G. Farlow*, Oct. 1875 (F, P, Y). MASSACHUSETTS: Medford: *F. S. Collins*, 21 May 1877 (N). Falmouth: on government wharf, Wood's Holl, *W. G. Farlow*, Aug. 1876 (F); on barnacles from planks, Eel Pond, Woods Hole, *W. R. Taylor*, 18 July 1925 (T); on barnacles, bridge at entrance to Eel Pond, Woods Hole, *W. R. Taylor*, 22 July 1921 (T); on pilings, Penzance Garage, Woods Hole, *Drouet 2131*, 14 Aug. 1937 (D, F, N, S, W). RHODE ISLAND: Newport, *I. Holden*, 9 May 1896 (F). CONNECTICUT: Black Rock, Bridgeport, *I. Holden*, 20 July 1892 (F, N). CALIFORNIA: Alameda, *W. J. V. Osterhout & N. L. Gardner*, 26 Sept. 1903 (Phyc. Bor.-Amer. 1162, T, Y).

OSCILLATORIA Vauch. ex Gom., Ann. Sci. nat. VII Bot. **16**: 198 (1892). *Oscillaria* of various authors.—One must be exceedingly careful, before determination of species in this and other genera is attempted, to exclude material in the hormogonial condition. Often thin and mucous sheaths are secreted about the hormogonia and give the appearance of a phormidioid or lyngbyoid plant mass. With the trichomes broken into short segments, the chances of discovering the maturely developed apices become very rare.[15]

[14] M. Gomont's letters to Prof. Farlow are to be found on file with other scientific correspondence of the latter in the Farlow Reference Library of Harvard University.

[15] Certain characters other than those employed in this paper have been suggested (see Geitler, Rabenh. Kryptogamen-Fl. **14**. 1930–32) as having taxonomic importance in the genus Oscillatoria: the direction of rotation of the living trichomes, the refraction of blue light by the cell-membranes or unseen sheaths, the reversible vacuolization of the protoplasm ('keritomy'), the presence of refractive accumulations within

Certain species often encountered in North America are here omitted from treatment because of absence of preserved material from southern Massachusetts; among these are *O. sancta* Kütz. ex Gom., *O. limosa* Ag. ex Gom., *O. curviceps* Ag. ex Gom., *O. rubescens* DC. ex Gom., *O. prolifica* (Grev.) Gom., *O. Agardhii* Gom., *O. animalis* Ag. ex Gom., *O. chalybea* Mert. ex Gom., *O. Okeni* Ag. ex Gom., *O. terebriformis* Ag. ex Gom., and *O. Grunowiana* Gom. I have been unable to locate the material upon which Croasdale based her reports of *O. nigra* and *O. angustissima* in *Fresh Water Alg. Woods Hole, Mass.*, 17 (1935) and hence exclude such reports from treatment here. *O. subuliformis* of Hazen, Rhodora 26: 215 (1924), is considered in this paper under *O. brevis* var. *neapolitana.*

Key to Species

I. Forms with large trichomes (6–60 μ in diameter), the majority of cells in the plant mass less than 1/3 as long as wide
  A. Plants strictly of fresh water, rarely found in secondarily brackish water
    1. Cross-walls never granulated; apices of trichomes capitate or subcapitate
      a. Plant-mass dark blue-green; trichomes dark blue-green, straight, rigid, fragile, not constricted at the cross-walls, 16–60 (usually 25–50) μ in diameter, at the apices somewhat attenuate and more or less uncinate, subcapitate and uncinate; cells 1/4–1/11 as long as wide; protoplasm finely, often coarsely, granulose; apical cell convex, without calyptra ..... *O. princeps*
      b. Plant-mass dark blue-green; trichomes bright blue-green, often mixed sparingly with other algae, straight or subflexuous, here and there uncinate-spiraled, never constricted at the cross-walls, 12–15 μ in diameter, at the apices briefly and often conspicuously attenuate-capitate, or truncate and uncinate or loosely terebriform; cells 1/3–1/6 (usually 1/4) as long as wide, 2–4 μ long; protoplasm finely granulose; cross-walls conspicuous, never granulated; membrane of the apical cell convex and slightly thickened ..... *O. proboscidea*
    2. Cross-walls always granulated; apices of trichomes capitate only in *O. anguina*
      a. Stratum blackish-green; trichomes somewhat torulose, straight below but somewhat spiraled and uncinate toward the apices, long and very slightly attenuated, not capitate, 9–11 μ in diameter; cells 1/2–1/6 as long as wide; apical cell rotund, without calyptra ..... *O. ornata*
      b. Stratum blackish-green; trichomes straight below,

---

or in conjunction with the apical cells, the thickness of cross-walls, and the presence of 'intercellular spaces.' Extended studies of such characters in well authenticated material of the more common species are much to be desired.

uncinate or conspicuously spiraled above, somewhat long-attenuate, obtusely capitate, not constricted at the cross-walls, 6–8 μ in diameter; cells 1/3–1/6 as long as wide; apical cell enlarged, rotund, the outer membrane thickened.....*O. anguina*

B. Plants strictly of salt or brackish water, rarely if ever found in fresh water

1. Plant-mass black; trichomes bright olive-green, straight, fragile, torulose, at the apices attenuate and noticeably arcuate, 17–29 μ in diameter; cells 1/3–1/7 as long as wide; protoplasm finely granulose; cross-walls coarsely granulated; apical cell rotund, seemingly capitate, the outer membrane thickened into a conspicuous convex calyptra.....*O. margaritifera*

2. Plant-mass blackish or olive-green; trichomes olive-green, elongate, straight, torulose, toward the apices long and conspicuously attenuate and arcuate, 7–11 μ in diameter; cells 1/2–1/4 as long as wide; cross-walls conspicuously granulated; apical cell seemingly subcapitate, rotund, the outer membrane thickened.....*O. nigro-viridis*

II. Forms with small trichomes (10 μ or less in diameter); the greater number of cells in the plant mass more than 1/3 as long as wide

A. Trichomes not attenuate at the apices, nor capitate with an enlarged apical cell

1. 1. Cells quadrate and shorter than wide.—Plant-mass bright or dark blue-green, in fresh water; trichomes brilliantly blue-green, straight, fragile, constricted at the cross-walls, straight or arcuate at the apices, 4–10 μ in diameter; cells subquadrate to 1/3 as long as wide; protoplasm coarsely granulose; cross-walls conspicuously granulated; apical cell rotund, with a thickened outer membrane.....*O. tenuis*

2. Cells quadrate and longer than wide

a. Stratum thin and web-like, yellowish-green, in fresh water; trichomes greenish-yellow, straight or curved, often arcuate at the apices, not constricted at the cross-walls, 3.5–4 μ in diameter; cells subquadrate to twice as long as wide; protoplasm scarcely granulose; cross-walls pellucid, ungranulated; apical cell rotund at the apex, without calyptra.....*O. chlorina*

b. Stratum thin, bright blue-green, in fresh or brackish water; trichomes very pale green, straight, fragile, not constricted at the cross-walls, arcuate at the apices, 2–3 μ in diameter; cells 2–3 times as long as wide; protoplasm scarcely granulose; cross-walls usually marked with two large protoplasmic granules; apical cell rotund above, without calyptra.....*O. amphibia*

B. Mature trichomes attenuate at the apices

1. Trichomes capitate with an enlarged apical cell.—Plant-mass bright blue-green, thin, in fresh water; trichomes pale blue-green, straight or flexuous, elongate, not constricted at the cross-walls, long-attenuate and conspicuously capitate at the apices, 2–3 μ in diameter; cells rarely subquadrate, up to 4 times as long as wide; protoplasm homogeneous;

cross-walls granulated; apical cell enlarged above, without calyptra ..... *O. splendida*

2. Trichomes not capitate with an enlarged apical cell
   a. Trichomes not constricted at the cross-walls
      (I) Apical cell truncate.—Stratum bright blue-green, in fresh or brackish water; trichomes bright blue-green (rarely yellowish-green or lead-colored), straight or undulate below, long-attenuate and briefly uncinate or spiraled at the apices, 3–5 μ in diameter; cells as a rule subquadrate, often longer or shorter than wide, 2–6 μ long; protoplasm finely granulose; cross-walls often conspicuous, often coarsely granulated; apical cell truncate, the outer membrane somewhat thickened ..... *O. granulata*
      (II) Apical cell acute-conical.—Stratum olive-green; trichomes blue-green, straight, briefly and subacutely attenuated and uncinate or spiraled at the apices, 4–6.5 μ in diameter; cells 1/3–1/2 as long as wide, protoplasm finely granulose; cross-walls not granulated; calyptra absent
         (A) Freshwater form, with trichomes 4–5 μ in diameter, the apices uncinate ..... *O. brevis*
         (B) Brackish or salt water form, with trichomes 5–6.5 μ in diameter, the apices uncinate or spiraled ..... *O. brevis* var. *neapolitana*
   b. Trichomes constricted at the cross-walls, at least at the apices
      (I) Stratum yellowish or yellow-green, thin, not rarely almost membranaceous, fragile, submersed in brackish water, rarely emersed and subaerial, usually intermixed with various other Oscillatoriaceae; living trichomes yellow-green, straight, rarely somewhat flexible, fragile, evidently constricted at the cross-walls, never torulose, 3–5 μ in diameter, straight or rarely scarcely curved or uncinate at the apices, very briefly attenuate; cells subquadrate to 1/3 as long as wide, 1.5–5.5 μ long; protoplasm finely granulose throughout the cell; cross-walls conspicuous, pellucid, never granulated; apical cell obtusely cylindric-conical, never capitate or calyptrate ..... *O. luteola*
      (II) Stratum bright green, in salt water; trichomes somewhat yellowish-green or blue-green, straight, fragile, slightly constricted at the cross-walls or almost torulose, briefly attenuate and undulate or uncinate at the apices, 3–5 μ in diameter; cells subquadrate; protoplasm uniformly granulose; cross-walls evident, sometimes punctate; apical cell more or less obtuse to subacute-conical, without calyptra ..... *O. laetevirens*
      (III) Stratum blue-green, in fresh water; trichomes straight, elongate, usually constricted at the cross-walls and always so at the apices, briefly and subobtusely attenuate and uncinate, 4–6 μ

in diameter; cells quadrate to 1/2 as long as wide; protoplasm finely granulose; cross-walls granulated; apical cell blunt-conical, without calyptra.....*O. formosa*

OSCILLATORIA PRINCEPS Vauch. ex Gom., Ann. Sci. nat. VII Bot. **16**: 206, pl. vi, f. 9 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 17 (1935). *Lyngbya gigantea* Lewis, Zirkle & Patrick,[16] Journ. Elisha Mitchell Sci. Soc. 1933: 221, pl. 16, f. 7 (1933). Authentic material: Farl., Anders. & Eat., Alg. Am. Bor. Exs. 177 (F, Y); Rabenh. Alg. 580 (T), 1122 (F), 1218 (F), 2535 (F, T); Wittr. & Nordst., Alg. exs. 393a, b (F).—Not uncommon in quiet fresh water. Specimens seen: FALMOUTH: in a pond, *H. Croasdale*, 16 July 1934 (D); cranberry pond north of West Falmouth, *E. T. Rose*, 13 July 1936 (D, N, S); Beebe's Pond near Falmouth, *H. Croasdale* (W); waterhole in bog near Chara Pond, *Drouet 1942*, 14 Sept. 1936 (D). DARTMOUTH: in a pond 1 mile south of Nonquitt, *E. T. Rose & Drouet 1890*, 18 July 1936 (D, F, T, Y).

OSCILLATORIA PROBOSCIDEA Gom., Ann. Sci. nat. VII Bot. **16**: 209, pl. vi, f. 10, 11 (1892). Authentic material: Rabenh. Alg. 2535 (F).—In fresh water: FALMOUTH: Shiverick Pond, *Drouet 2180*, 4 Sept. 1937 (D, F, N, S); on submerged water plants in sewage, 'Episcopal Ocean,' *E. T. Rose & Drouet 1869*, 4 July 1936 (D, F, S, T, Y).

OSCILLATORIA ORNATA Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 214, pl. vi, f. 15 (1892). Authentic material: Moug. & Nestl., Stirp. crypt. vogeso-rhenanae 898 (N, in part, not F).—Specimens seen: GOSNOLD: Cuttyhunk, *W. R. Taylor*, 27 July 1926 (T). DARTMOUTH: with *O. princeps* in a pond 1 mile south of Nonquitt, *E. T. Rose & Drouet 1890*, 18 July 1936 (D, F, T, Y).

OSCILLATORIA ANGUINA Bory ex Gom., Ann. Sci. nat. VII Bot. **16**: 214, pl. vi, f. 16 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 17 (1935).—Often abundant in masses of other algae in ponds and bogs. Specimens seen: FALMOUTH: Fresh Pond, Nobska Point, *Drouet 1949*, 16 Sept. 1936 (D); with *Phormidium ambiguum* on mud and debris in shallow water, Wood Pond, Woods Hole, *Drouet 1107*, 23 June 1934 (D). GOSNOLD: Pink Pond, Nonamesset Island, *H. Croasdale*, 2 July 1934 (D); with other algae on the bottom of Nashawena Pond, Nashawena Island, *Drouet 1874*, 8 July 1936 (D, F, N, S, T, Y).

OSCILLATORIA MARGARITIFERA Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 216, pl. vi, f. 19 (1892); Taylor and Hazen, RHODORA **26**: 212, 215 (1924), in part; Croasdale, Fresh Water Alg. Woods Hole, Mass., 17 (1935), in part; not of Collins, Phyc. Bor.-Amer. **35**: 1708a, b (1911). Authentic material: Hauck & Richt., Phyk. univ. 474

[16] I am indebted to the authors, and especially to Dr. Conway Zirkle, for the privilege of examining the TYPE material of this species. I interpret the specimens as trichomes of *O. princeps* in the hormogonial state, as the description and figure suggest.

(F, in part).—Forming slimy black expansions in shallow salt marshes and brackish ponds; often seen mixed with other algae in similar habitats. *Hydrocoleum glutinosum* and *H. Holdenii*, which are probably more abundant in salt marshes about Woods Hole than is *O. margaritifera*, are often mistaken for this species. Specimens seen: FALMOUTH: on bottom of Mill Pond, Woods Hole, *Drouet 1945*, 17 Sept. 1936 (D, F, N, S, T, Y), *Drouet 2178*, 2 Sept. 1937 (D, N, S). GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W); on bottom and floating in Tub Pond north, Penikese Island, *Drouet 1864*, 1 July 1936 (D, N, S).

OSCILLATORIA NIGRO-VIRIDIS Thw. ex Gom., Ann. Sci. nat. VII Bot. **16**: 217, pl. vi, f. 20 (1892). *O. lactevirens* of Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913), not Crouan ex Gom. Authentic material: Hauck & Richt., Phyk. univ. 186 (F).—Often found floating, or covering rocks, woodwork, barnacles, or other algae in quiet salt, seldom in brackish, water. Our specimens from salt water invariably measure 7 μ in diameter, the lower limit of measurement as described by Gomont; in only one specimen seen, my *1934* from brackish water cited below, do the trichomes approach the maximal width of 11 μ. Gomont described this species as inhabiting typically, "ad summum limitem maris, palos, portuum muros, rupes limosas, necnon ostia coenosa fluminum," etc. and *O. Corallinae* Gom., distinguished from *O. nigro-viridis* by the habit of growth and the type of protoplasmic granulation, as typically "in Corallinis aliisque algis necnon Zoophytis parasitica, infra limitem superiorem maris," etc. On the New England coast, at least, the same morphological type grows indiscriminately upon rocks, wood, attached animals, and other algae, usually at low tide level. Often the cross-walls are not as conspicuously granulated as in Gomont's figure of *O. nigro-viridis* and in the authentic material cited above, but much more so than in Crouan, Alg. Mar. Finistère 329 (F), cited as authentic material of *O. Corallinae*. Material from collections cited below has been seen by Prof. Frémy and Prof. Geitler. Specimens examined: FALMOUTH: on woodwork, Eel Pond, Woods Hole, *F. S. Collins*, 15 Aug. 1904 (as *O. lactevirens*, N), *Drouet 1119*, 27 June 1934 (D); on government wharf at high water mark, Wood's Holl, *W. G. Farlow*, Aug. 1876 (F); on submerged Fucus, Eel Pond, Woods Hole, *Drouet 1203*, 29 July 1934 (D); on Enteromorpha, Eel Pond, Woods Hole, *Drouet 1012*, 12 July 1930 (D); on stumps of Spartina etc. in a pool south of Chara Pond, *Drouet 1934*, 18 Aug. 1936 (D, F). OAK BLUFFS: on algae dredged off East Chop, *H. Croasdale*, 15 July 1930 (D). FAIRHAVEN: on Rhizoclonium and rocks, tide pool, Black Rock, *Drouet 1196*, 22 July 1934 (D, F, N, T, Y, Frémy, Geitler); Sconticut Point, *Drouet 1218*, 22 July 1934 (D).

OSCILLATORIA TENUIS Ag. ex Gom., Ann. Sci. nat. VII Bot. **16**: 220, pl. vii, f. 2, 3 (1892); Hazen, RHODORA **26**: 211 (1924); Croasdale, Fresh Water Alg. Woods Hole, Mass., 17 (1935). *O. limosa* of Wolle,

Fresh Water Alg. U. S. 313 (1887), in part, not Ag. ex Gom. *O. tenuis* var. *tergestina* of Croasdale, loc. cit. (1935). *O. brevis* of Croasdale, ibid. 18 (1935), not Kütz. ex Gom. Authentic material: Kütz. Dec. 34 (F); Rabenh. Alg. 50 (F), 1016 (F), 1599 (T).—Var. NATANS (Kütz.) Gom., ibid. 221, with trichomes 6–10 μ in diameter, and var. TERGESTINA (Kütz.) Rabenh. ex Gom., loc. cit., with trichomes 4–6 μ in diameter, are both abundantly represented in the freshwater collections. The two varieties are as a rule present in the same collections, but in variable proportions in different collections. The var. *natans* may sometimes be confused with *O. ornata*. Specimens seen: [?] EASTHAM: pond 10 miles south of Truro, *E. T. Rose*, 12 July 1936 (D, F, S, T, Y). FALMOUTH: in shallow water of Iron Pond, Woods Hole, *Drouet 1939*, 12 Sept. 1936 (D, N); floating on a pool across from Cedar Swamp, Woods Hole, *Drouet 1940*, 13 Sept. 1936 (D, F, N, S, T, Y); in a shallow pond by Quisset Avenue north of Golf Course, Woods Hole, *Drouet 1906*, 5 Aug. 1936 (D, N, S); Shank's Little Pond, Falmouth, *H. Croasdale*, 4 Aug. 1934 (D); subaerial on mud, Wood Pond, Woods Hole, *Drouet 1918*, 17 Aug. 1936 (D); muddy shore of Shiverick Pond, Falmouth, *Drouet 1230*, 8 Aug. 1934 (D); High Hat Pond, *H. Croasdale*, 31 July 1934 (D). GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W). FALL RIVER: Fall River (Wolle Collection, P).

OSCILLATORIA CHLORINA Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 223 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 17 (1935).—*Fig. 8 and 9.* Occasionally seen in freshwater ponds. In drying, the trichomes become bright yellow in color. This color is not always produced, however, if the material is dried after a long period of preservation in formalin. See Geitler, Rabenh. Kryptogamen-Fl. 14: 952 (1932). Specimens seen: FALMOUTH: pond at dump on Gifford Street, Falmouth, *H. Croasdale*, 29 June 1934 (D, W); pond on Whitamore Estate, Woods Hole, *H. Croasdale*, 2 Aug. 1934 (D, F, S, T, Y); with *O. princeps* in a cranberry pond north of West Falmouth, *E. T. Rose*, 13 July 1936 (D).

OSCILLATORIA AMPHIBIA Ag. ex Gom., Ann. Sci. nat. VII Bot. **16**: 221, pl. vii, f. 4, 5 (1892); Hazen, RHODORA **26**: 211 (1924); Croasdale, Fresh Water Alg. Woods Hole, Mass., 17 (1935); not of Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913). Authentic material: Kütz. Dec. 129 (F); Wittr. & Nordst., Alg. exs. 997 (F).—Mixed with other algae in fresh and brackish water. Specimens seen: GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W); Penikese Island, *T. Hazen*, 1923 (T); Pasque Island, *H. Croasdale*, 24 June 1930 (D); small pond on northeastern Pasque Island, *Drouet 1873*, 8 July 1936 (D, F, T, Y).

OSCILLATORIA SPLENDIDA Grev. ex Gom., Ann. Sci. nat. VII Bot. **16**: 224, pl. vii, f. 7, 8 (1892); Hazen, RHODORA **26**: 211 (1924); Croasdale, Fresh Water Alg. Woods Hole, Mass., 18 (1935). Authentic material: Wittr. & Nordst., Alg. exs. 784 (F); Rabenh. Alg. 161 (F),

329 (F); Hauck & Richt., Phyk. univ. 475 (F).—Common in the freshwater collections. Specimens seen: FALMOUTH: Fresh water, Woods Holl, *Trelease*, 1881 (F); in Shank's Little Pond, *H. Croasdale*, 12 Aug. 1934 (D, S); Oyster Pond, *H. Croasdale*, 12 Aug. 1931 (D, Y), *Drouet 1110*, 18 June 1934 (D, F, T); south shore, Nobska Pond, *E. T. Rose*, 18 June 1936 (D); in shallow water of Iron Pond, Woods Hole, *Drouet 1939*, 12 Sept. 1936 (D). GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W).

OSCILLATORIA GRANULATA Gardn., Mem. New York Bot. Gard. **7:** 37, pl. 8, f. 71 (1927); descr. emend. Drouet, RHODORA **39:** 278, f. 2 (1937).—Common in shallow freshwater and secondarily brackish pools along the seashore. I have already noted (loc. cit.) the geographic distribution of this species. Additional material from southern Massachusetts: FALMOUTH: in swampy area north of Nobska Point, *Drouet 2079*, 5 July 1937 (D, N, S). GOSNOLD: in bog above Tarpaulin Pond, Naushon Island, *Drouet 2126*, 12 Aug. 1937 (D, F, N, S).

OSCILLATORIA BREVIS Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16:** 229, pl. vii, f. 14 (1892); not of Croasdale, Fresh Water Alg. Woods Hole, Mass., 18 (1935). Authentic material: Rabenh. Alg. 30 (F, T). —Usually found on wet soil or in temporary pools of fresh water. Specimens seen: FALMOUTH: on wet soil in greenhouse at railroad station, Falmouth, *Drouet 1936*, 29 Aug. 1936 (D). FAIRHAVEN: on mud about a well and cow-trough by Highway 6 east of Fairhaven, *E. T. Rose & Drouet 1888*, 18 July 1936 (D, N, S).

OSCILLATORIA BREVIS var. NEAPOLITANA (Kütz.) Gom., Ann. Sci. nat. VII Bot. **16:** 229, pl. vii, f. 15 (1892). *O. subuliformis* of Hazen, RHODORA **26:** 215 (1924); of Croasdale, Fresh Water Alg. Woods Hole, Mass., 18 (1935); not Kütz. ex Gom. Authentic material: LeJolis, Alg. mar. Cherbourg 174 (F).—Frequent in brackish water, often mixed with other algae. Specimens seen: FALMOUTH: floating in a brackish pool south of Chara Pond, *Drouet 1921*, 18 Aug. 1936 (D, S); subaerial on mud, Gardiner's Ditch, Woods Hole, *Drouet 1197*, 22 July 1934 (D, T, W). GOSNOLD: Botanical Survey of Penikese Island, 24 July 1923 (W); Penikese Island, *T. Hazen*, 1923 (T).

OSCILLATORIA LUTEOLA Drouet, RHODORA **39:** 277, f. 1 (1937). *Oscillatoria* sp. of Hazen, RHODORA **26:** 215 (1924). Authentic material: Phyc. Bor.-Amer. 710 (W, T, Y), 1054 (W, T, Y).—Very common and abundant in quiet brackish water. Southern Massachusetts specimens in addition to those cited with the original description: FALMOUTH: floating on brackish water, Gardiner's Ditch, Woods Hole, *Drouet 2087*, 13 July 1937 (D); in brackish water of ditches about Mill Pond, Woods Hole, *Drouet 2179*, 2 Sept. 1937 (D, F, N, S).

OSCILLATORIA LAETEVIRENS Crouan ex Gom., Ann. Sci. nat. VII Bot. **16:** 226, pl. vii, f. 11 (1892); not of Davis, Bull. U. S. Bur. Fish 1911(2): 798 (1913). *Phormidium persicinum* of Davis, Phyc. Bor.-Amer. **29:** 1401 (1907), in part, not Gom.—On rocks and woodwork

between tide limits. Our material is very similar to that in a specimen collected by Crouan at Brest and obligingly transmitted to me by Prof. Frémy. Specimens seen: FALMOUTH: on rocks in spray of drain from Supply Department Building, Eel Pond, Woods Hole, *Drouet 1904*, 2 Aug. 1936 (D, F, N, S, T, Y); jar in Marine Biological Laboratory, *B. M. Davis*, May 1907 (Phyc. Bor. Amer. 1401, T; and in part, W, N, Y).

OSCILLATORIA FORMOSA Bory ex Gom., Ann. Sci. nat. VII Bot. **16**: 230, pl. vii, f. 16 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 18 (1935). Authentic material: Moug. & Nestl., Stirp. crypt. vogeso-rhenanae 898 (F, N); Wittr. & Nordst., Alg. exs. 677 (F).—Not common in freshwater ponds. The two specimens are from the same locality: FALMOUTH: 'Desmid Haven' Pond, near West Falmouth, *H. Croasdale*, July 1935 (D), *C. M. Palmer*, 27 July 1936 (D).

SPIRULINA Turp. ex Gom., Ann. Sci. nat. VII Bot. **16**: 249 (1892); emend. G. Schmidt apud Geitler, Beih. z. bot. Centralbl. II, **41**: 283 (1925). *Arthrospira* Stizenb. ex Gom., ibid., 246 (1892).—It is doubtful, in light of the recent work on the morphology of the trichome in this group,[17] that distinct genera can still be retained for the septate and non-septate forms, as Geitler has repeatedly pointed out. In this paper I do not include treatment of *S. tenerrima* Kütz. ex Gom., which Gomont (ibid. 253) cites from the United States, and *S. Gomontiana* (Setch.) Geitl., reported by Hazen (as *Arthrospira Gomontiana* Setch.) in RHODORA **26**: 215 (1924) from brackish water on Penikese Island; I have seen material of neither of these species from southern Massachusetts.

KEY TO SPECIES

I. Spirals loose, i.e., not touching each other
  A. Spiral irregular.—Trichomes 1.2–1.8 μ in diameter, the spirals 3.2–5 μ in diameter, 3–5 μ or more apart . . . . *S. Meneghiniana*
  B. Spiral regular
    1. Trichomes pale blue-green, 1.2–1.7 μ in diameter, the spirals 2.5–4 μ in diameter, 2.7–6 μ apart . . . . . *S. major*
    2. Trichomes blue-green, 1.5–2 μ in diameter, the spirals 7.5–11.5 μ in diameter, 20–28 μ apart . . . . . *S. stagnicola*
II. Spirals touching each other.—Plant-mass bright blue-green; trichomes pale blue-green, 1–2 μ in diameter, the spirals 3–5 μ in diameter, contiguous or here and there scarcely separated . . . . . *S. subsalsa*

SPIRULINA MENEGHINIANA Zanard. ex Gom., Ann. Sci. nat. VII Bot. **16**: 250, pl. vii, f. 28 (1892). Authentic material: Rabenh. Alg. 895 (F), 1015 (F).—Apparently uncommon in brackish habitats and seen in only two specimens: FALMOUTH: 'occasional filaments of a fine loose Spirulina,' West Falmouth, *F. S. Collins*, 10 Aug. 1883 (N); West Falmouth, *F. S. Collins*, 10 Aug. 1883 (N).

[17] See list of major works in Crow, Trans. Amer. Microsc. Soc. **46**: 139–148 (1927), and in Geitler, Rabenh. Kryptogamen-Fl. **14**: 917 (1932).

Spirulina major Kütz. ex Gom., Ann. Sci. nat. VII Bot. **16**: 251, pl. vii, f. 29 (1892); Croasdale, Fresh Water Alg. Woods Hole, Mass., 18 (1935). *S. tenuissima* of Hazen, Rhodora **26**: 215 (1924); Croasdale, loc. cit. (1935); not Kütz. ex Gom. *S. densa* Lillick,[18] Amer. Midland Nat. **16**: 210, f. 1A (1935). Authentic material: Hauck & Richt., Phyk. univ. 38 (F); Rabenh. Alg. 250 (F).—Not commonly seen in the southern Massachusetts flora except among other algae in quiet brackish water. The species is widely distributed in inland freshwater habitats. Specimens seen: falmouth: with other Myxophyceae floating in Gardiner's Ditch, Woods Hole, *Drouet 1134*, 30 June 1934 (D, F, T, Y); Penzance salt marsh, Woods Hole, *E. T. Rose*, 13 July 1936 (D); in ditch at east end of Mill Pond, Woods Hole, *Drouet 2085*, 9 July 1937 (D, N, S). gosnold: Botanical Survey of Penikese Island, 24 July 1923 (W); Penikese Island, *T. Hazen*, 1923 (T).

Spirulina stagnicola Drouet, Rhodora **39**: 279, f. 3 (1937).—One collection from brackish water: gosnold: Nonamesset Island, *E. T. Rose*, 21 June 1936 (type in Herb. F. Drouet; isotypes: F, N, S, T, W, Y).

Spirulina subsalsa Oerst. ex Gom., Ann. Sci. nat. VII Bot. **16**: 253, pl. vii, f. 32 (1892); Collins, Rhodora **2**: 43 (1900); Tilden, Minn. Alg. **1**: 89 (1910); Davis, Bull. U. S. Bur. Fish. 1911(2): 798 (1913). *S. tenuissima* of Farlow, Mar. Alg. New Engl., 31 (1891); not of Hazen, Rhodora **26**: 215 (1924); not of Croasdale, Fresh Water Alg. Woods Hole, Mass., 18 (1935). *S. Thuretii* of Farlow, loc. cit. (1891). *Arthrospira subsalsa* Crow apud Croasdale[19] *pro synon.*, Fresh Water Alg. Woods Hole, Mass., 18 (1935). Authentic material: Farl., Anders. & Eat., Alg. Am. Bor. Exs. 178 (F, Y); LeJolis, Alg. mar. Cherbourg 199 (F); Kütz. Dec. 14: 131 (T).—Often forming blue-green coatings on the bottom in shallow, quiet salt (rarely in brackish) water; more often mixed with other algae in salt marshes, on pilings of wharves, etc. Both f. genuina Gom. and f. oceanica (Crouan) Gom., ibid. 254, are distinguishable in the collections. Specimens seen: falmouth: on algae attached near garbage wharf, Eel Pond, Woods Hole, *C.-C. Jao*, 20 July 1931 (D, S, W, Y); Woods Hole, *I. Holden*, 15 Aug. 1894 (F); Eel Pond, Woods Holl, *W. G. Farlow*,

[18] Miss Lois Lillick has obligingly allowed me to examine a slide of the original (type) material of this species. Measurements of a considerable number of trichomes show that this material falls well within the dimensional range given by Gomont for the trichomes of *S. major*. I am unable to detect any morphological difference between the trichomes in this material of *S. densa* and those of the authentic material of *S. major* cited here. Another isotype of *S. densa* has been examined in the Herb. New York Bot. Gard.: indiana: floating in Lake St. Mary, Notre Dame University campus, Notre Dame, *J. H. Hoskins 606*, Aug. 1928.

[19] By a liberal interpretation of the present International Rules, we may accept this as the valid publication of the binomial *Arthrospira subsalsa*, even though not designated specifically as a new combination. Taxonomists may well be startled at the naive presentation of a classification of the species of Spirulina by Crow in Trans. Amer. Microsc. Soc. **46**: 142ff (1927).

Sept. 1881 (F); on dead algae in five feet of water, Wood's Holl, *W. G. Farlow*, Aug. 1876 (F); Eel Pond, Woods Hole, *Anon.*, 30 July 1908 (F); in water squeezed from Vaucheria Thuretii, Woods Hole, *W. T[release]*, 15 Sept. 1881 (F); Wood's Holl, Aug. 1876 (Y). GOSNOLD: Gosnold Pond, Cuttyhunk Island, *Anon.*, 28 July 1927 (W). OAK BLUFFS: in shallow water, Squash Meadow Pond, *G. Velasquez & Drouet 1896*, 21 July 1936 (D, F, T).

OSBORN BOTANICAL LABORATORY OF YALE UNIVERSITY AND
DEPARTMENT OF BOTANY, MARINE BIOLOGICAL LABORATORY

EXPLANATION OF FIGURES

FIG. 1. *Schizothrix arenaria*, upper portion of filament from *Drouet 1217*. FIG. 2. *Hydrocoleum glutinosum*, from *Drouet 1917*, showing the apex of a single trichome with sheath. FIG. 3. *Hydrocoleum Holdenii*, the upper portion of a trichome with sheath drawn from the type specimen in the Farlow Herbarium. FIG. 4. *Lyngbya infixa*, an entire filament from *Drouet 1132*. FIG. 5. *Lyngbya Lagerheimii*, from *Drouet 1860*, the upper portion of a filament. FIG. 6. *Phormidium persicinum*, portion of a single trichome from Phyc. Bor.-Amer. 1401 (W). FIG. 7. *Phormidium molle*, portion of a single trichome from a specimen collected by F. S. Collins at Bourne. FIG. 8 AND 9. *Oscillatoria chlorina*, upper portions of two trichomes from West Falmouth, collected by E. T. Rose.—All these figures have a magnification of × 800 and, with the exception of Fig. 3, 6, and 7, are drawn from living material.

NOTES ON THE FLORA OF NOVA SCOTIA

A. E. ROLAND

IN early September 1936, I spent several days upon Long Island, Digby County. Time was taken to visit the Bay of Fundy seashore; and a number of plants were collected along the low banks of a sheltered cove. A *Cornus*, new to me, covered the exposed sides of the banks. I am indebted to Frère Marie Victorin of the University of Montreal for identifying it for me as *Cornus canadensis*, var. *intermedia*.

The following morning, barely enough time was spent upon Brier Island to cross it and return. At the further side by the lighthouse is a meadow many acres in extent, and protected from the waves of the Bay of Fundy only by a low line of rocky ledges. Ten minutes only were spent upon this meadow or bog; but they were sufficient to collect a number of sheets of *Schizaea*, which was found wherever it was looked for; and to secure some individuals of the *Lophiola* which was growing scattered over the area.

The following are some of the plants collected in this region; and

others that may be of interest from different parts of the province. Specimens are in the herbarium of the Nova Scotia Agricultural College, Truro; or at Acadia University, Wolfville, N. S.

SCHIZAEA PUSILLA Pursh. DIGBY COUNTY: behind the sea wall, south end of Brier Island. Probably common over many acres.

JUNIPERUS HORIZONTALIS Moench. DIGBY COUNTY: grassy roadside above Westport, Brier Island. Previously known from headlands, further up the Bay of Fundy.

SPOROBOLUS UNIFLORUS (Muhl.) Scribn. Common in southwestern Nova Scotia and now known from Kings and Halifax Counties. DIGBY COUNTY: common in pastures and bogs, Central Grove. KINGS COUNTY: low places in barrens, Auburn. HALIFAX COUNTY: damp hollows, slaty upper beach of (Shubenacadie) Grand Lake.

LILIUM CANADENSE L. Previously known from near Truro to Cape Breton. Probably general from Windsor to Truro. HANTS COUNTY: river alluvium along St. Croix River near Windsor.

LOPHIOLA AMERICANA (Pursh) Wood. DIGBY COUNTY: scattered in a meadow by the lighthouse, southern end of Brier Island. The third station in Nova Scotia.

IRIS SETOSA Pall., var. CANADENSIS Foster. DIGBY COUNTY: headlands of Bay of Fundy, Central Grove.

PYRUS ARBUTIFOLIA (L.) L. f. KINGS COUNTY: border of Lily Pond, Centreville, Sept. 5th. With the berries small and still bright red in color. Previously known from Yarmouth and Shelburne Counties.

AMELANCHIER FERNALDII Wiegand. GUYSBOROUGH COUNTY: growing about two feet high in a high bog near Larry's River. Previously reported in Nova Scotia only from St. Paul's Island.

HELIANTHEMUM CANADENSE (L.) Michx. KINGS COUNTY: common upon the sandy plains at Auburn.

CORNUS CANADENSIS L., var. INTERMEDIA Farr. DIGBY COUNTY: headlands of the Bay of Fundy, Central Grove.

HALENIA DEFLEXA (Sm.) Griseb. GUYSBOROUGH COUNTY: wet meadow, near Sherbrooke.

Although this species is listed by Nichols and by Perry from Northern Cape Breton Island, this is apparently the first record of it from the mainland of Nova Scotia.

CYNOGLOSSUM BOREALE Fernald. HANTS COUNTY: on the gypsum outcrops between Windsor and Brooklyn.

IVA ORARIA Bartlett. KINGS COUNTY: on the brackish soil by the covered bridge, Hortonville.

NOVA SCOTIA AGRICULTURAL COLLEGE,
Truro, Nova Scotia.

NOTES FROM THE UNIVERSITY OF MINNESOTA HERBARIUM—I[1]

John B. Moyle

Extensions of Ranges and Additions to the Minnesota Flora

Echinochloa Walteri (Pursh) Nash. Not recorded in the manuals as occurring in Minnesota. Waseca Co.: shores of Lake Waseca, *Aiton* Aug. 1890. Lac Qui Parle Co.: in 1 foot of water, west end of Lac qui Parle, *Moyle* 3005.

Bromus Arvensis L. Clearwater Co.: dry, open soil on campus of the University of Minnesota Forestry School, Itasca State Park, *Moyle* 2738.

B. tectorum L. Hubbard Co.: dry roadsides near Arago Post Office, *Moyle* 472. Pipestone Co.: Pipestone, *Fellows* 3.

Eleocharis olivacea Torr. Two collections from the north-central part of the state. Todd Co.: Philbrook, *Hotchkiss & Jones* 4136. Clearwater Co.: mucky shore of Mink Lake, Itasca State Park, *Moyle* 931.

E. ovata (Roth) R. & S., var. Heuseri (Uechtritz) Garcke. Collected only from the Anoka outwash plain. Anoka Co.: Peaty margin of small pond near Coon Lake, *Cooper* Oct. 12, 1930; Carlos Avery Game Refuge, *Moyle & Webb* 2683.

Scirpus Clintonii Gray. Ramsey Co.: in acid peat meadows along the road to New Brighton, *Rosendahl* 6174. Stearns Co.: St. Cloud, *Campbell* 86. Hennepin Co.: Minneapolis, *Sandberg* June 1894. Clearwater Co.: dry norway pine forest, Itasca State Park, *Moyle* 2030.

S. paludosus A. Nels. Occurs quite commonly along the margins of the more or less alkaline prairie-lakes of southwestern Minnesota. Ottertail Co.: Fergus Falls, *Ballard* 2539, 2544. Pipestone Co.: Pipestone, *Fellows* 54. Yellow Medicine Co.: shallow lake bed 4 miles north of Hendricks, *Kreuholz* 3. Traverse Co.: marshy shores of Lake Traverse, *Butters, Johnson & Rosendahl* 4056. Kandiyohi Co.: Willmar, *Frost* 264. Lyon Co.: Dennin Slough, *Hotchkiss & Jones* 3982, 3987. Big Stone Co.: sandy margin of island in Big Stone Lake, *Moyle* 2317.

Chenopodium Boscianum Moq. Fairly common in wooded places in southern Minnesota, but little collected. Hennepin Co.: Meeker Island, *Sheldon* Sept. 1894. Murray Co.: common in oak forest on the shores of Lake Shetek, *Moyle* 2993.

Cardamine pratensis L. Reported as occurring in the state by both Lapham[2] and Upham[3] but neither reported nor collected since.

[1] Specimens cited are all in the Univ. of Minn. Herbarium. All specimens of a given species or variety are cited. The counties mentioned are all in Minnesota.

[2] Lapham, Catalogue of the Plants of Minnesota, Milwaukee 1865. Published in the report of the Minn. State Hort. Soc. 1875.

[3] Upham, Catalogue of the Flora of Minnesota; Geol. and Nat. Hist. Surv. of Minn. Part VI of the Ann. Rep. for 1883.

CLEARWATER CO.: Mossy tamarack bog, Itasca State Park, *Moyle* 2153.

DIPLOTAXIS MURALIS DC. Formerly known only from the southwest corner of the state. PIPESTONE CO.: along railroad yards, Pipestone, *Rosendahl* 4909. Collected in the summer of 1936 in the northern part of the state. BELTRAMI CO.: abundant for miles along the road north of Washkish, *Rosendahl & Moyle* 2190.

RUBUS ACAULIS Michx. Occurs in the muskegs near the Canadian border. LAKE OF THE WOODS CO.: near Baudette, Fadness 1928. This specimen, which was mailed in for determination, was accompanied by the statement "it grows in great profusion on our farm." In the summer of 1936, numerous large patches were found growing in a drained muskeg 8 miles south of Baudette, *Rosendahl & Moyle* 2180.

STROPHOSTYLES HELVEOLA (L.) Britton. Abundant in the southeastern portion of the state but uncommon westward. HOUSTON CO.: Jefferson, *Lyon* 387. WABASHA CO.: shore of Lake Pepin, *Manning*, Aug. 20, 1892; Lake city, *Manning* Aug. 8, 1897. GOODHUE CO.: July 1884, Aug. 1885. HENNEPIN CO.: Minneapolis, *Ramaley* Aug. 1894. SCOTT CO.: west of Savage, along railroad embankment, *Rosendahl* 4229. BLUE EARTH CO.: *J. B. L.* no date. WATONWAN CO.: Madelia, *C. A. S.* Aug. 20, 1889. LAC QUI PARLE CO.: growing in crevices in schistose rocks on an island in Lac qui Parle, *Moyle* 2304. This last collection represents a considerable westward extension of range.

EUPHORBIA PETALOIDEA Engelm. A plains species that has been twice collected in the western part of the state. OTTERTAIL CO.: Clitherall, *Campbell* July 1887; again in 1936 within a few miles of this location; sandy beach of Ottertail Lake, *Moyle* 2333.

CORNUS SUECICA L. This arctic species seems not to be recorded as occurring in the United States. ST. LOUIS CO.: fairly abundant in a perched black spruce bog on a high and heavily glaciated ridge near Ely, *Moyle* 2394; also observed in a spruce and white cedar bog near Low Lake in the same region.

CUSCUTA CUSPIDATA Engelm. Range cited in Gray's Man. edit. 7 as "Neb. to Mo. and Tex." LAC QUI PARLE CO.: shore of Lac qui Parle on *Salix amygdaloides* and *Solidago*, *Moyle* 2295.

SALVIA LANCEOLATA Willd. WINONA CO.: Winona, annotated "escaped," *Holzinger*, no date; *Holzinger* July 10, 1888. LAC QUI PARLE CO.: roadside near west end of Lac qui Parle, *Moyle* 3001.

PLANTAGO ARENARIA W. & K. HENNEPIN CO.: Mississippi River flats near Ford Dam, Minneapolis, *Moyle & Remmele* Oct. 9, 1932; *Cooper* Oct. 26, 1934; *Moyle* 3121. OTTERTAIL CO.: dry, gravelly beaches of Lake Pelican, *Stevens* July 16, 1933.

UNIVERSITY OF MINNESOTA.

TUCKERMAN TO CAREY.—The following letter, sent by Dr. C. G. ALM, Keeper of the Linnéträdgärden at Upsala, is well worth publicly reproducing.—EDS.

Cambridge 1 Oct. 1845.

Dear Sir

Permit me to express to you the sorrow, which, in common with every American Botanist, I felt, at your affliction, and your irreparable losses. Your kind letter has given me the opportunity to offer you the sympathy even of one so little known to you as myself. What Botanist could be silent? But alas how little will words avail in such a case. We can only bow to the Supreme.

I trust you may yet have many years of delightful toil, in restoring your invaluable American Herbarium—in building it anew. I am always glad when my stock of a rare plant within the circuit of my herborising is exhausted, for the pleasure of making a new stock—& yet better samples. For myself I am ready to offer to supply you within 2 or 3 years at the furthest (my present avocations place me some miles from my Herb^{m}, and I have no time to renew my dupl.) with a set of alpine & other N. E. Carices as also with a large set of foreign ones including the rare Scandinavian species. Your other corresp^{s} must all renew their specimens—and so ere many years may not your Herb^{m} arise Phoenix-like, restored? I can also, & will most gladly, offer you other plants—the moment I am free to devote myself wholly to Botany. I cannot forbear mentioning here that in the Great Hamburgh fire Dr. Buek, the botanist, lost his whole Herb^{m}. The very last occupation in which I saw the illustrious Robert Brown employed was in putting up a box of his duplicates to send to the Hamburgh naturalist. The memory of this must be my excuse, if I have erred in making the offer above. Did however any Botanist feel differently—I should think little of him indeed.

Permit me also to send with this another copy of my Carices, and another little book, both of which publ. being published for gratuitous circulation.

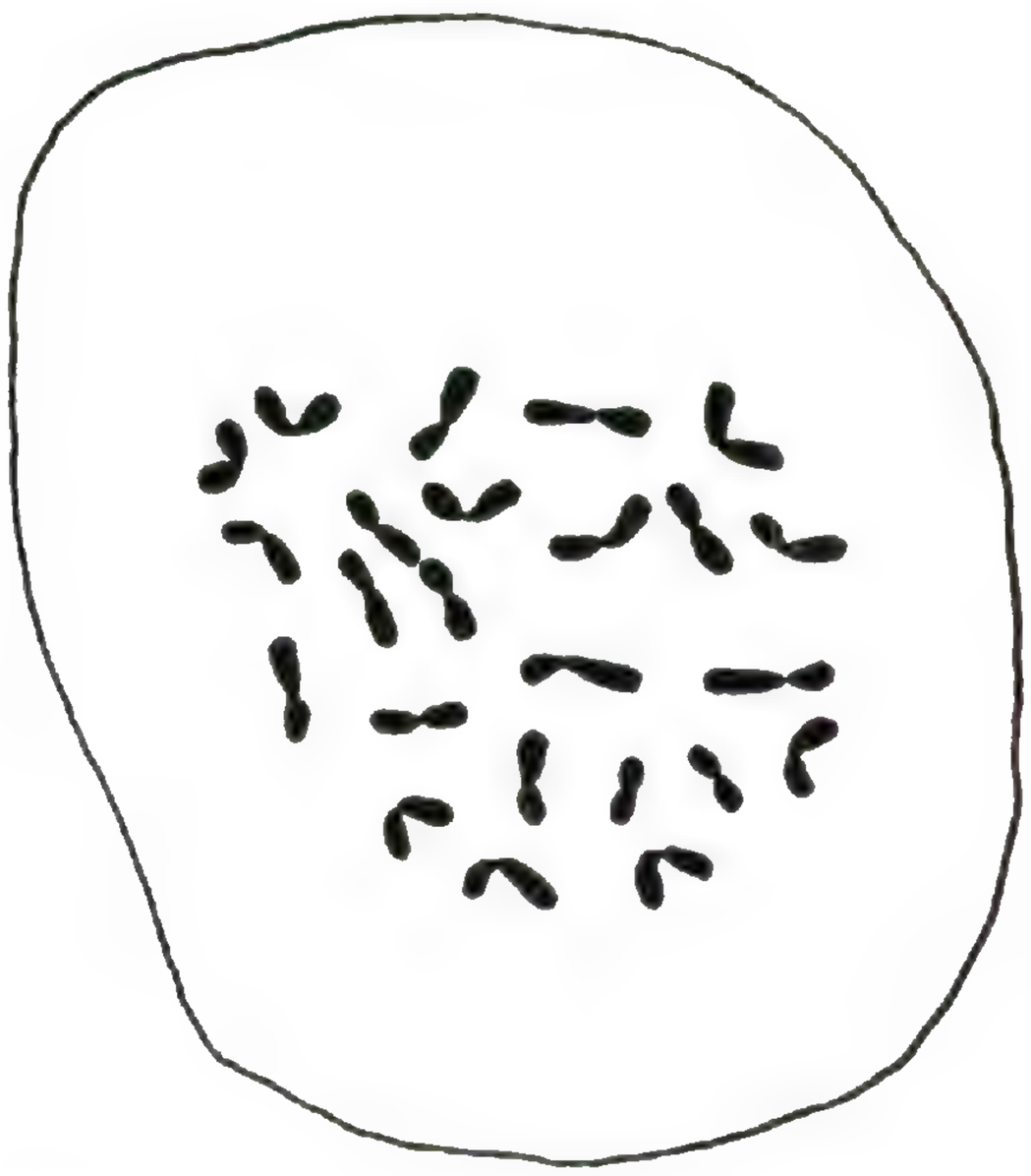
I am always most happy to have the opportunity of offering them to Botanists.

W.th great respect
I am yours humb. Serv^{t}
Edw. Tuckerman

John Carey Esq.
Greenwich st. N. Y.

CHROMOSOMES OF KALMIOPSIS.—Henderson[1] described an ericaceous shrub of restricted range in the Siskiyou Mountains of Oregon under the name *Rhododendron Leachianum*, a species close, in his opinion, to *R. lapponicum*. Rehder[2] established the monotypic genus *Kalmiopsis*, taxonomically near *Loiseleuria*, *Kalmia*, and *Rhododendron*, and made the combination *Kalmiopsis Leachiana* (Henderson) Rehder.

Kalmiopsis Leachiana (grown at Cornell University by W. C. Wilson; herbarium specimen in the Bailey Hortorium) has 24 somatic chromosomes (FIG. 1); each of the chromosomes has a median or submedian constriction.



Hagerup[3] determined the *n*-number of *Rhododendron lapponicum* to be 13. Sax[4] found *n*-numbers of 13 and 26 in *Rhododendron* and concluded that 13 is its fundamental number. Nakamura[5] made similar observations for the genus. Bowers[6] counted 12 gametic

[1] Henderson, L. F. New Plants from Oregon. RHODORA **34**: 203–206. 1931.

[2] Rehder, Alfred. *Kalmiopsis*, a New Genus of Ericaceae from Northwest America. J. Arnold Arboretum **13**: 30–34. 1932.

[3] Hagerup, O. Morphological and Cytological Studies of Bicornes. Dansk Bot. Arkiv. **6**: 1–26. 1928.

[4] Sax, Karl. Chromosome Stability in the Genus *Rhododendron*. Amer. J. Bot. **17**: 247–251. 1930.

[5] Nakamura, M. Cytological Studies on the Genus *Rhododendron*. J. Soc. Trop. Agriculture **3**: 103–108. 1931.

[6] Bowers, C. G. The Development of Pollen and Viscin Strands in *Rhododendron catawbiense*. Bull. Torrey Bot. Club **57**: 285–314. 1930.

chromosomes in *Rhododendron*, but Sax investigated the same species and found them to fit into a 13-system. The single species of *Loiseleuria* and the two karyologically known species of *Kalmia* belong, like *Kalmiopsis*, to a 12-chromosome system: *Loiseleuria procumbens*, $n = 12$; *Kalmia latifolia*, $n = 12$, and *Kalmia glauca*, $n = 24$ (Hagerup). These chromosome numbers, therefore, afford an additional basis for the generic segregation of *Kalmiopsis* and support Rehder's views concerning the affinities of the genus.—J. T. Baldwin, Jr., Bailey Hortorium and Department of Botany, Cornell University.

PLANTS NEW TO MINNESOTA

Olga Lakela

Eight species new to Minnesota have been collected by the writer in the environs of Duluth during the past two seasons. One of these, *Poa Chaixii* Vill. is new to America.[1]

Ammophila breviligulata Fernald grows abundantly on the sandy beach of Lake Superior on Minnesota Point. It occurs commonly on the sandy south shore of the lake. With reference to the species, Warren Upham in the Catalogue of the Flora of Minnesota concludes with supposition, "doubtless also on the shore of this lake in Minnesota." It has not been found on the north shore of Lake Superior which is a shingle beach. The specimens, 1316 and 1613 from Minnesota Point are the first collections made in the state.

Deschampsia flexuosa (L.) Trin. occurs on Minnesota Point. The dense, vigorously growing tufts of this grass are fairly numerous, but scattered along the main trail through a distance of about one-eighth of a mile. The recorded range of this species includes Wisconsin. Warren Upham supposed its occurrence in Minnesota. The specimens 2069, 2102 and 2106 were collected from a colony growing in moist soil under pine trees, near a small bog, in Sec. 19.

Artemisia Stelleriana Bess. A single poorly growing clump in wet sand of the Superior Bay shore in Sec. 13, in the narrowest part of Minnesota Point, locally known as the "Barrens." Specimen 2121 was the only stem in flower among the few sterile ones in 1937. During the preceding year the plant did not bloom. In a few other places on the bay front farther north, sterile stems have been noted. Evidently the habitat is not congenial to this eastern Asiatic species.

Iris Pseudacorus L. Several plants grow at the "Barrens" on Minnesota Point, along the margin of a small, wet meadow overgrown with sedges and rushes of several species. Specimens 1466a, 1466b and 1504 were collected in 1936. In 1937 one plant was noted

[1] Lakela, Olga. *The Occurrence of Poa Chaixii in America*, Rhodora, xl. 73 (1937).

in flower on Oatka Beach Addition, about one mile north of the "Barrens." The plant appeared in the second year vegetation in this habitat, among *Bidens* in shallow water of the bay shore.

STELLARIA AQUATICA (L.) Scop. grows abundantly along several streams in East Duluth. The specimens, October 15, 1936, were collected in Congdon Park, between Fourth and Superior Streets, 32nd. Ave. east. The plants grow in broken rock of the stream bed, and in crevices of gabbro near the water level. The leaves in vigorously growing plants are variegated, streaked with white.

POTENTILLA GRACILIS Dougl. was found on the north-facing slope of Hunter's Hill, in grassy turf covering rocks in an old stream bed. Grasses dominate the ground vegetation in the open places; higher on the slope grow thickets of several species of shrubs and young oak trees. The specimens 2088a were collected on July 20, 1937; it appears to be the typical form.

POLEMONIUM OCCIDENTALE Greene. Several vigorously growing plants were found along a small stream in a mixed forest on the northeast-facing slope of Hunter's Hill, among *Laportea canadensis* and *Pteretis nodulosa*. It may be a garden escape. However, inquiries in the nearby residences and the Greenhouse resulted without information regarding the species. The specimens were collected on July 11, 1937.

The writer wishes to extend thanks to Dr. John W. Moore, University of Minnesota, who made the final check in the manuscript, of the synonymy and the determinations of the species.

STATE TEACHERS COLLEGE,
Duluth, Minnesota.

Volume 40, no. 474, including pages 221–248, was issued 4 June, 1938.

AUG 3 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. August, 1938. No. 476.

CONTENTS:

Gonolobus within the Gray's Manual Range. *Lily M. Perry* 281

On Houttuyn's Overlooked Binomials for Native or Introduced Plants in Eastern North America. *E. D. Merrill* 288

Smelowskia and Polyctenium. *Reed C. Rollins* 294

Names of three Species of Brassica. *Louis C. Wheeler* 306

Polygonum Kelloggii and its Allies. *Louis C. Wheeler* 309

Thalictrum polycarpum S. Wats., a Disputed Name. *Louis C. Wheeler* 317

Type of the Genus Lepidospartum. *Louis C. Wheeler* 320

Taylor's Marine Algae. *Francis Drouet* 323

Dormancy of Seeds. *M. L. F.* 324

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

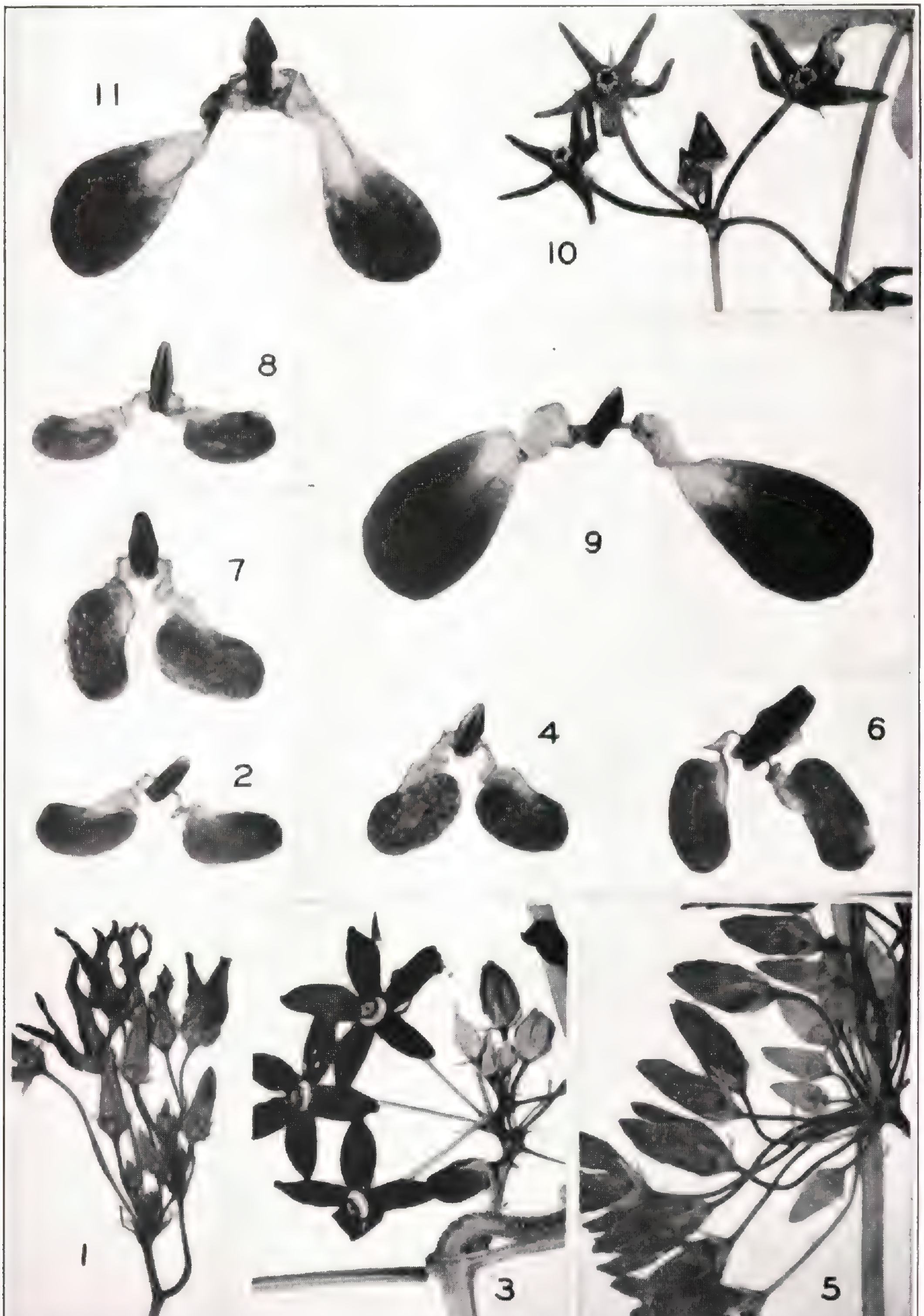
GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.



GONOLOBUS: parts of inflorescences, × 1; pollinia, × 40.
G. OBLIQUUS, FIGS. 1 and 2. G. CAROLINENSIS, FIGS. 3 and 4. G. DECIPIENS, FIGS. 5 and 6. G. SHORTII, FIG. 7. G. BALDWINIANUS, FIG. 8. G. GONOCARPUS, FIGS. 9 and 10. G. SUBEROSUS, FIG. 11.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **August, 1938.** **No. 476.**

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXIII

I. GONOLOBUS WITHIN THE GRAY'S MANUAL RANGE

LILY M. PERRY

(Plate 494)

ALMOST two years ago Professor Fernald, working over his collection from Virginia, laid aside as perplexing a specimen belonging to the genus *Gonolobus* Michx. Fl. Bor.-Am. l. 119 (1803), i. e. *Vincetoxicum* Walt. Fl. Carol. 13, 104 (1788). Although there is no doubt as to the priority of Walter's name, nevertheless the continued use in Europe of *Vincetoxicum* Moench, Method. 717 (1794) produces a nomenclatural confusion of generic names which calls for some deliberation. Further, the situation was not covered in the statement of the cases for "Conservation of later Generic Homonyms," Kew Bull. (1935). Since the question must be settled sooner or later for the coming issue of the Manual, Professor Fernald requested that I assemble the literature and specimens immediately available for this study. The outcome of this work is briefly given below.

A proposal for the conservation of *Gonolobus* Michaux against *Vincetoxicum* Walter was submitted to Miss M. L. Green, Secretary of the Special Committee on Phanerogamae and Pteridophyta. Her reply is as follows, "the better way is to conserve Vincetoxicum Moench, Method. 717 (1794); if this is conserved, then Vincetoxicum Walt. becomes a nomen rejiciendum and Gonolobus becomes the right name for the genus." She cited fifteen additional references for *Vincetoxicum* Moench and added, "I am sure you will agree that the conservation of Vincetoxicum Moench is very desirable and thus it is

the simplest way to solve all difficulties." Again in another letter she pointed out that "The European Vincetoxicum is so widely used that there is every chance of its being conserved."

Superficially this seems to clear the way to use the name *Gonolobus* for our plant of southeastern United States. Unfortunately, at different times two entirely unlike concepts have been accepted for the genus: (1) Michaux's original as interpreted by Professor Asa Gray, Proc. Amer, Acad. xii. 75–79 (1877), Syn. Fl. ed. 1 and ed. 2, ii[1]. 102 (1878 and 1886); and (2) that of Miss Anna Murray Vail, Bull. Torr. Bot. Club, xxvi. 425–431 (1899). Many botanists earlier than A. Gray maintained *Gonolobus* as delineated by Michaux, nevertheless, Gray's particular interpretation is in sharp contrast with Miss Vail's, since both left evidence of a detailed examination of all the original material of the genus. Michaux's description of the genus *Gonolobus*, although slightly more amplified than that of Walter's *Vincetoxicum*, is unquestionably synonymous with the latter; in addition, Michaux specifically mentioned *V. gonocarpos* Walt. and *V. acanthocarpos* Walt. as synonyms of his *G. macrophyllus* and *G. hirsutus* respectively. In so doing, according to our present International Rules of Nomenclature, he invalidated his own specific names. The third species, *G. laevis*, is poorly described. The type material (fide Vail) is a mixture of flowers corresponding in part to Michaux's *G. laevis*, and foliage and fruit belonging to *Enslenia albida* Nutt., i. e. *Ampelamus albidus* (Nutt.) Britt. This fact was noted by both Miss Vail and Dr. Gray, each choosing a different part of the mixture as the type of the species.

Miss Vail, guided by foliar characters, chose the material of *Enslenia albida* Nutt.[1] By doing this, she believed she had cleared up the discrepancy between the original description of the species and the plants passing as such. Unfortunately, since she had restored Michaux's first two species to the genus *Vincetoxicum* Walt., she was compelled to use *G. laevis*, the only remaining species, in order to maintain the genus *Gonolobus*. That is, she took up the name *Gonolobus* in the sense of *Enslenia* Nutt. She did this apparently unmindful of the

[1] Rightfully the specimens of *Enslenia albida* Nutt. (*Gonolobus laevis* sensu Vail, Bull. Torr. Bot. Club, xxvi, 427 (1899), non Michx.) should be called *Ampelamus albidus* (Nutt.) Britt. as *Enslenia* Nutt. Gen. 1. 164 (1818) is antedated by *Enslenia* Raf. Fl. Ludovic. 35 (1817). Rafinesque called attention to this in Journ. Phys. lxxxix. 258 (1819) and Amer. Month. Mag. iv. 192 (1819), but Britton actually made the combination *Ampelamus albidus*, Bull. Torr. Bot. Club, xxi. 314 (1894) (as *Ampelanus*).

vast discrepancy between the floral characters (cf. particularly the contrast in the stigmas) of her chosen type and Michaux's original description of the genus. In this she has been followed by a number of American authors.

On the other hand, Dr. Gray, in his consideration of Michaux's third species, accepted that part of the material belonging to *Gonolobus* (excluding one flower-cluster of somewhat uncertain identity) as *G. laevis* and was content at that. By this interpretation *Gonolobus* Michaux is a thoroughly consistent and distinct genus. This is the concept first accepted by Robert Brown in his paper "On the Asclepiadaceae," Mem. Wern. Nat. Hist. Soc. i. 12–78 (1811), and by many later authors. On this basis the genus now contains over one hundred described species. Although approximately forty of these have been transferred to *Vincetoxicum* Walt. by Standley and others, *Gonolobus* is the name most widely known in literature and adopted by all who have done monographic work on the family.

The indication of a type-species should be a helpful factor in wholly re-establishing the older and original concept. Not having discovered any in the literature examined, I am here choosing *G. macrophyllus*, the first of the three described by Michaux, as the standard-species of the genus. This species has not only the (usually) angled pod (from which character the name is derived) but also the more important generic character of the flattened stigma. *G. macrophyllus* has been somewhat buffeted about. Gray regarded it as a variety of *G. laevis*, and Michaux automatically created an invalid name by citing *V. gonocarpos* Walt. as a synonym. Nomenclaturally the species appears to be *G. gonocarpos* (Walt.).

Below is given a key and a short summary of the species occurring within the Manual range. Plate 494 shows, in particular, buds, corolla-lobes and pollinia (figs. including retinaculum, caudicles and pollinia). It has been suggested that the more dependable characters are to be found in the pollinia [in the broader sense used to include the retinaculum (the body to which the pollen masses are attached), the caudicles (arms between the pollen masses and the retinaculum) and the pollinia (strictly speaking, the pollen masses)] than in the over-emphasized characters of the corona. From the plate it will be seen that the characters of the pollinia are perhaps [more] useful in separating groups of species rather than single species. Much broader study would be essential to any further statement on these characters.

KEY TO SPECIES OF GONOLOBUS WITHIN THE MANUAL RANGE

a. Follicles costate-angled, not muricate: calyx glabrous or slightly pubescent toward the apex of the lobes: crown low, 10-lobed, at base of anther-column: pollinia slenderly obovoid, attached to the retinaculum by caudicles at least 0.2 mm. long; anther-sacs inconspicuous, with narrow slits.
Flower-buds short-conical, abruptly acuminate: calyx practically glabrous: corolla-lobes broadly lanceolate, usually pubescent (becoming glabrate) within, 5–7 mm. long, about twice the length of the calyx-lobes. . . . . 1. *G. suberosus.*
Flower-buds conical, gradually acute or acuminate: calyx glabrous or the lobes ciliolate towards the apex: corolla-lobes linear-lanceolate, glabrous within, three or four times the length of the calyx-lobes. . . . . 2. *G. gonocarpos.*

a. Follicles muricate, not costate-angled: calyx pubescent: crown cup-shaped, as high as the anther-column or higher: pollinia semi-lunate or oblong, attached to the retinaculum by caudicles less than 0.2 mm. long; anther-sacs obvious with fairly open slits. . . . *b.*

b. Flower-buds bluntly ovoid, corolla rotate. . . . . 3. *G. carolinensis.*

b. Flower-buds oblong-conical, corolla ascending. . . . *c.*

c. Crown of fairly thin texture, the long bifid lobes overtopping the anther-column.
Corolla white or whitish, lobes 8–12 mm. long, 1.5–2.5 mm. broad, imbricate but only slightly contorted in the bud: longer teeth of crown-lobes usually subulate 4. *G. Baldwynianus.*
Corolla brownish-purple, lobes 10–15 mm. long, 3–6 mm. wide, strongly contorted in the bud: longer teeth of crown-lobes flat. . . . . 5. *G. decipiens.*

c. Crown fleshy, as long as or slightly longer than the anther-column.
Corolla-lobes broadly linear, 13–15 mm. long, 2–2.5 mm. wide, dark purple. . . . . 6. *G. Shortii.*
Corolla-lobes slenderly linear, 9–12 mm. long, 1.5–2 mm. wide, greenish-fuscous outside, purplish within 7. *G. obliquus.*

1. GONOLOBUS SUBEROSUS (L.) R. Br. in Ait. Hort. Kew. ed. 2, ii. 82 (1811); Schultes, Syst. Veg. vi. 59 (1820); Gray, Proc. Amer. Acad. xii. 75 (1877), Syn. Fl. ed. 1 and ed. 2, ii[1]. 103 (1878 and 1886). *Cynanchum suberosum* L. Sp. Pl. 212 (1753). *Vincetoxicum gonocarpos* Walt. Fl. Carol. 104 (1788), in part (fide A. Gray). *V. suberosum* (L.) Britton, Mem. Torr. Bot. Club, vi. 266 (1894).

According to various manuals this species ranges from Virginia to Florida, along and near the coast. I have seen no collections from north of North Carolina.

2. G. **gonocarpos** (Walt.) comb. nov. *Vincetoxicum gonocarpos* Walt. Fl. Carol. 104 (1788), in part (fide A. Gray). *Gonolobus macrophyllus* Michx. Fl. Bor.-Am. i. 119 (1803). *G. laevis* var. *macrophyllus* Gray, Proc. Amer. Acad. xii. 76 (1877), Syn. Fl. ed. 1 and ed. 2, ii[1]. 103 (1878 and 1886). *G. laevis* Michx. l. c.; Gray, op. cit. p. 75 and p. 103.

Virginia and South Carolina south to Alabama and southwest to Arkansas and Texas. The following collections have been seen. VIRGINIA: sandy wooded bottomland of Nottoway River, Courtland, *Fernald & Long 6672;* rich dry woods, Little Neck, *Fernald & Long 5004;* Powhatan Swamp, ½ mile southwest of Five Forks, *L. F. & F. R. Randolph 398.* NORTH CAROLINA: 5 miles southwest of Durham, *Wiegand & Manning 2628.* SOUTH CAROLINA: without definite locality, *Mellichamp.* INDIANA: 1 mile east of the mouth of White River, *Deam 32969;* in low woods north of Eggwood Pond about 5 miles northwest of Patoka, *Deam 16925;* ¾ mile southeast of Yankeetown, *Deam 37583.* KENTUCKY: without definite locality, *Short.* TENNESSEE: Cedar Barrens of Middle Tennessee, *Gattinger;* near Nashville, *Gattinger* (Curtis, N. Amer. Pl. 188); Knoxville, *Ruth 175* in part. ALABAMA, Gadsden, *Vasey.* ARKANSAS: without definite locality, *ex hb. Thurber.* LOUISIANA: without definite locality, *Hale;* near Alexandria, *C. R. Ball 529.* TEXAS: Dallas, *Reverchon;* Houston, *Lindheimer.*

Although Walter's description might be applied to more than one species of *Gonolobus*, I am accepting the interpretation of Dr. Gray and others as to its identity, *i. e.* that it, at least in part, is identical with Michaux's *G. macrophyllus*, hence I have taken up the earlier specific epithet. With the more abundant collections at hand Gray's characters distinguishing *G. laevis* Michx. from var. *macrophyllus* Gray show a high degree of variability, hence, I am inclined to regard them as a single entity.

3. G. CAROLINENSIS (Jacq.) Schultes, Syst. Veg. vi. 62 (1820); Gray, Proc. Amer. Acad. xii. 76 (1877), Syn. Fl. ed. 1 and ed. 2, 104 (1878 and 1886). *Cynanchum carolinense* Jacq. Coll. ii. 288 (1788), Ic. Pl. Rar. ii. t. 342 (1788). *Vincetoxicum acanthocarpos* Walt. Fl. Carol. 104 (1788). *Gonolobus hirsutus* Michx. Fl. Bor.-Am. i. 119 (1803). *Vincetoxicum carolinense* (Jacq.) Britton, Mem. Torr. Bot. Club, v. 265 (1894). *Odontostephana carolinensis* (Jacq.) Alexander in Small, Man. 1077 (1933).

Delaware south to Georgia (and possibly Florida), west to Tennessee and Alabama. DELAWARE: Middletown, August 16, 1908, *Bartram;* Dover, *Tatnall 1467.* MARYLAND, Middle Neck Road, *Tatnall 2814;* Melwood, *C. P. Smith 3181;* Clinton, *C. P. Smith 3180.* DISTRICT OF COLUMBIA: near Washington, *Holm, Vasey, Chickering, Ward;* Anacostia, *C. P. Smith 3066.* VIRGINIA, dry sandy hickory and oak woods, Burt, *Fernald & Long 3657;* north of Moore's Mill, *Fernald & Long 3656;* northern end of Knott's Island, *Fernald & Long 4145;* rich dry woods, Little Neck, *Fernald & Long 5003;* Great Neck, *Fernald, Griscom & Long 4693, 5002;* Grove, *L. F. & F. R. Randolph 361;* near Williamsburg, *Grimes 3666, 3690;* near Cedar Creek, Frederic County,

Griscom & Hunnewell 15244. North Carolina: 8 miles north of Chapel Hill, *Wiegand & Manning 2630;* near Statesville, *Gray, Sargent, Redfield & Canby;* Tryon, *Churchill.* South Carolina, Santee Canal, *Ravenel.* Georgia, without definite locality, *Biltmore Herbarium 3923b;* near Athens, *Perry 1001.* Tennessee: slope of Cumberland Plateau, west of Bon Air, *C. A. & U. F. Weatherby.* Alabama: without definite locality, *Short.*

I am unable to say whether Jacquin's or Walter's is the earlier specific name. Walter's name seems to have been lost in synonymy and I have accepted the name customarily used. Dr. Gray believed Walter's species and *G. carolinensis* to be identical. Miss Vail found the latter and *G. hirsutus* Michx. were "entirely impossible" to separate with the material which she had at hand. I am inclined to agree with Alexander who accepted *G. hirsutus* and *G. carolinensis* as synonymous but nevertheless separated another entity passing under *Vincetoxicum carolinense*. A glance at plate 494, figs. 3, 5, and 4, 6, shows the difference in the flower-buds, the spread of the corolla, and the retinacula.

4. G. Baldwynianus Sweet, Hort. Brit. ed. 2, 360 (1830); Gray, Proc. Amer. Acad. xii. 77 (1877) (as *Baldwinianus*), Syn. Fl. ed. 1 and ed. 2, ii[1]. 104 (1878 and 1886). *Vincetoxicum Baldwinianum* (Sweet) Britton, Mem. Torr. Bot. Club, v. 265 (1894). *Odontostephana Baldwiniana* (Sweet) Alexander in Small, Man. 1077 (1933).

Georgia and Alabama west to Missouri and Oklahoma. The following specimens have been examined. Alabama: dry woods, *Buckley 10.* Missouri: Swan, *Bush 239;* Noel, *Bush 5745;* Cedar Gap, *Lansing 3077;* Eagle Rock, *Bush 230;* near Eagle Rock, along Missouri-Arkansas state line, *Palmer 39460.* Arkansas, Beaver, *Palmer 39473;* Washington County, June 1835, *Engelmann.* Oklahoma, near Page, *Blakeley 1422;* near Idabel, *Houghton 3946.*

This species is readily recognized by the whitish corolla, the subulate lobes of the crown and the very slender retinacula.

5. G. **decipiens** (Alexander) comb. nov. *Odontostephana decipiens* Alexander in Small, Man. 1077 (1933).

This species of "woods and stream-banks, in rather acid soil, Coastal Plain and occasionally adj. provinces, S. C. to Okla., Mo., and Md." according to Alexander, is represented in our herbarium only from Missouri, Arkansas and Louisiana. Missouri: St. Louis County, May 31, 1887, *Eggert;* Allenton, June, 1880, *Letterman;* Meramec Highlands, June 25, 1904, *Gleason;* near Pacific, *Greenman 3899,* June 3, 1918, *Churchill;* Pleasant Grove, *Bush 362;* Prosperity, *Bush 2147;* Oronogo, *Palmer 36033.* Arkansas, Camden, June 15, 1850, *Fendler.* Louisiana: without definite locality, *Hale.*

The best characters of this species are the oblong-conical flower-bud with corolla-lobes strongly contorted, the ascending corolla and the comparatively longer flat teeth of the crown-lobes. In contrast the flower-buds of *G. carolinense* (from which species this has been segregated) are bluntly ovoid, the corolla of the mature flower is rotate (not ascending), the crown-lobes are somewhat variable, but the pollinia are slightly smaller and the retinacula much smaller than in *G. decipiens*.

6. G. SHORTII Gray, Bot. Gaz. viii. 191 (1883). *G. obliquus* var. *Shortii* Gray, Syn. Fl. ed. 1, ii[1]. 104 (1878). *Vincetoxicum Shortii* (Gray) Britton, Mem. Torr. Bot. Club, v. 266 (1894). *Odontostephana Shortii* (Gray) Alexander in Small, Man. 1077 (1933).

Range given by Alexander as Georgia to Kentucky and Pennsylvania. Unfortunately in the Gray Herbarium this species is represented only by the two collections cited by Dr. Gray. KENTUCKY, Lexington, *Short.* GEORGIA, near Rome, 1882, *Chapman.*

7. G. OBLIQUUS (Jacq.) Schultes, Syst. Veg. vi. 64 (1820); Gray, Proc. Amer. Acad. xii. 76 (1877), Syn. Fl. ed. 1 and ed. 2, ii[1]. 104 (1878 and 1886). *Cynanchum obliquum* Jacq. Coll. i. 148 (1786), Ic. Pl. Rar. ii. t. 341 (1786–93). *Vincetoxicum obliquum* (Jacq.) Britton, Mem. Torr. Bot. Club, v. 266 (1894). *Odontostephana obliqua* (Jacq.) Alexander in Small, Man. 1077 (1933).

Pennsylvania south to Georgia west to Ohio, Indiana, Tennessee and Missouri. PENNSYLVANIA, without definite locality, 1862, *C. E. Smith;* river-banks in Lancaster and Franklin Counties, *Porter;* banks of Susquehanna, Lancaster County, *Porter.* MARYLAND: Bloomington, *J. D. Smith.* DISTRICT OF COLUMBIA: near Washington, *Ward, Holm.* VIRGINIA: near Middletown, *Griscom and Hunnewell 18815;* Peaks of Otter, Bedford County, July 29, 1871, *Curtiss.* NORTH CAROLINA, Hot Springs, Madison County, June 7, 1899, *Churchill;* near Alexander, Buncombe County, *Biltmore Herbarium 3928.* GEORGIA, near Rome, 1882, *Chapman.* INDIANA, along White River, 2 miles above Shoals, *Deam 17181.* TENNESSEE: Knoxville, June and July, 1895, *Ruth.*

Readily distinguished by its many-flowered and very often compound umbels and the linear-ligulate lobes of the corolla.

II. ON HOUTTUYN'S OVERLOOKED BINOMIALS FOR NATIVE OR INTRODUCED PLANTS IN EASTERN NORTH AMERICA

E. D. Merrill

(Plate 495)

Houttuyn's[1] "Naturlyke historie," written in Dutch, was frankly an attempt to popularize the binomial system. Christmann and Panzer's[2] "Pflanzensystem," published in German, was to a large degree, although not entirely, a translation of Houttuyn's earlier work, and was illustrated by the same plates, with the interpolation of a few new ones.

Although Houttuyn was the author of over 8800 pages of botanical matter, his work is merely listed in Pritzel's "Thesaurus" under Linnaeus' "Systema naturae," item 5404, as a Dutch edition of Linnaeus' work, without mention of its author's name. What Houttuyn did was to expand the approximately 2350 pages of edition 12 of the "Systema naturae" into 37 volumes containing about 22,000 pages, largely original work, illustrated by 296 distinctly good copper plates. The second part, 14 volumes, somewhat over 8800 pages, with 105 plates, is wholly botanical. Christmann and Panzer fare scarcely better at Pritzel's hands, although their names are mentioned as the authors of the German edition of Linnaeus' "Systema plantarum," item 5431 "nach Anleitung des holländischen *Houttuyn*'schen Werkes übersetzt." This is the only place I have noted in Pritzel's "Thesaurus" where Houttuyn's name is mentioned in connection with this work. This statement applies to the second edition of the "Thesaurus" (1872–77). In the first edition (1751) the entry appears under Houttuyn (item 4730), although in this edition the Cristmann and Panzer entry is under Linnaeus' "Systema naturae". One curious phase of the situation is that in the entire 37 volumes of

[1] Houttuyn, M. Naturlyke historie of uitvorige beschryving der dieren, planten en mineraalen, volgens het samenstel van den heer Linnaeus. Met naauwkeurige afbeeldingen. Eerste deels i. (1761)—xviii. (1773); Tweede deels i. (1773)—xiv. (1783); Derde deels i. (1781)—v. (1785). The 18 volumes of the "Eerste deels" consider the animals, the 14 volumes of the "Tweede deels" the plants, and the 5 volumes of the "Derde deels" the minerals.

[2] Christmann, D. and Panzer, G. W. F. Des Ritters Carl von Linné Königlichen Schwedischen Leibarztes &c. vollständiges Pflanzensystem nach der dreyzehnten lateinischen Ausgabe und nach Anleitung des holländischen Houttuynischen Werks übersetzt und mit einer ausführlichen Erklärung ausgefertiget. i. (1777)—xiv. (1788). The first seven volumes are by Christmann, the last seven by Panzer; see xiii. pt. ii, Vorbericht [2]. (1787).

PEDICULARIS LABRADORICA Wirsing.

Reproduction of plate 10, Wirsing's "Eclogicae botanicae" (1778). This figure was also reproduced by Panzer, Pflanzensyst. viii. *t. 57C* (1782).

Houttuyn's work his name does not appear on the title page of a single volume, and I have detected it in only six places where it is appended to introductory matter. As to Christmann and Panzer there is no evidence of authorship of their 14 volume work until the second part of volume 13 appeared in 1787, ten years after publication commenced. In the preface, which is signed by Panzer, is a statement that Christmann was the author of the first seven volumes and that Panzer was the author of the last seven. Manifestly the several authors involved were not seeking for publication credit!

While some of Houttuyn's new species were accepted by his contemporaries and immediate successors, it has become increasingly evident that a very considerable number of his new names have been entirely overlooked, and the same statement applies to the fewer new names published by Christmann and Panzer. Two or three generic names and at least 100 binomials, validly published by these authors between the years 1773 and 1788, do not appear in any indices or nomenclators that have been issued since the works under discussion were published.

In spite of the relatively early dates of these extensive, well illustrated, but now little known and less consulted works, few changes in accepted nomenclature are involved. Most of them appertain to species of Asia and Malaysia, and particularly to those of South Africa. In collating the two works and in checking the binomials with those used in standard works of a similar nature, I have noted four cases where the currently accepted binomials for two native and two introduced species in the eastern United States must be replaced by earlier, and for the most part overlooked, binomials. For another introduced species, *Polygonum cuspidatum* Sieb. & Zucc., for those who prefer to recognize smaller generic units, attention is called to the fact that *Renoutria* Houtt. (1777) replaces *Pleuropterus* Turcz. (1848). The task of collating the two works was not a simple one, for Houttuyn did not consistently indicate his new genera and new species as such; and Christmann and Panzer, who published various new names, did not indicate such names as new.

It seems desirable to publish the following notes on the American species for the benefit of those botanists interested in problems of nomenclature appertaining to eastern North American plants. No new binomials are involved, but merely replacements of four currently accepted names by earlier ones. There are a few other overlooked

binomials for American species in the two works under discussion, but in no case do they affect nomenclature, all of them falling as synonyms of previously described species. Among these are the following: *Anagallis flava* Houtt. Nat. Hist. II. vii. 514 (1777) = *Lysimachia quadrifolia* Linn.; *Cardamine virginiana* Panzer, Pflanzensyst. viii. 282 (1782) = *Arabis virginica* (Linn.) Trelease; *Eriophorum virginianum* Houtt. Nat. Hist. II. xiii. 127 (1782) = *E. virginicum* Linn.; *Helianthus dodecapetalus* Panzer, Pflanzensyst. ix. 557 (1783) = *H. decapetalus* Linn.; *Helleborus trifoliatus* Houtt. Nat. Hist. II. ix. 262 (1778) = *Coptis trifolia* (Linn.) Salisb.; *Medeola virginiana* Houtt. Nat. Hist. II. viii. 416 (1777) = *M. virginica* Linn.; *Osmunda virginica* Panzer, Pflanzensyst. xiii. pt. i, 57 (1786) = *Botrychium virginianum* (Linn.) Sw.; and *Panax trifoliatum* Panzer, Pflanzensyst. x. 335 (1783) = *Panax trifolium* Linn. It is planned to publish a general consideration of all the new binomials published by Houttuyn and by Christmann and Panzer at a later date.

Polygonaceae

Polygonum cuspidatum Sieb. & Zucc. Abh. Akad. Muench. iv. pt. ii, 208 (1846) (Fl. Jap. Fam. Nat. ii. 84); Nakai, Fl. Korea. ii. 173 (1911). *Renoutria japonica* Houtt. Nat. Hist. II. viii. 640, *t. 51, f. 1* (1777); Christm. Pflanzensyst. vi. 628, *t. 51, f. 1* (1780); Ohki, Bot. Mag. Tokyo xl. 49 (1926); Danser, Bull. Jard. Bot. Buitenz. sér. III. viii. 26 (1926), non *Polygonum japonicum* Meisn. *Polygonum pictum* Sieb. Jaarb. Nederl. Maatsch. Aaanm. Tuinb. 44 (1848), *nomen nudum*. *Polygonum Sieboldii* Reinw. ex De Vriese, op. cit. 31. 1850, *in syn.;* L. H. Bailey, Cycl. Am. Hort. iii. 1393. *f. 1880* (1901). *Polygonum Zuccarinii* Small, Mem. Dept. Bot. Columbia Univ. i. 158. *t. 66* (1895). *Polygonum Renoutria* Makino, Bot. Mag. Tokyo xv. 84 (1901), Somuku-Dzusetsu, ed. 3, i. 75. *t. 75* (1910). *Pleuropterus Zuccarinii* Small in Britt. & Br. Ill. Fl. North. U. S. ed. 2, i. 676, *f. 1655* (1913). *Pleuropterus cuspidatus* H. Gross in Loesen. Beih. Bot. Centralbl. xxxvii. pt. ii, 114 (1919). *Pleuropterus cuspidatus* Moldenke, Torreya xxxiv. 7. 1933.

This was described by Houttuyn as the type of a new genus, *Renoutria*, listed in "Index Kewensis" as a genus of uncertain status, but not included in Bentham and Hooker's "Genera Plantarum" nor in Engler and Prantl's "Die Natürlichen Pflanzenfamilien." Nevertheless, if one wishes to recognize generic segregates in this group, *Renoutria* Houtt. (1777) will replace *Pleuropterus* Turcz. (1848). In 1901 Makino recognized *Renoutria japonica* Houtt. as being identical with the very common *Polygonum cuspidatum* Sieb. & Zucc., and

in 1926 Danser reproduced Houttuyn's original description and illustration. Since 1895 the species has acquired at least four bibliographic synonyms, although under the present rules Siebold and Zuccarini's specific name is valid in *Polygonum*. The "earlier" *P. cuspidatum* Willd. appears only in synonymy, and is hence not valid. These synonyms are *Polygonum Zuccarinii* Small (1895), *Polygonum Renoutria* Makino (1901), *Pleuropterus Zuccarinii* Small (1913), *Pleuropterus cuspidatus* H. Gross (1919), and *Pleuropterus cuspidatus* Moldenke (1933). For those who recognize small genera in this group the binomial should be *Renoutria japonica* Houtt. Should *Pleuropterus* Turcz. (1848) be ultimately conserved over *Renoutria* Houtt., for which no valid reason exists, then a new combination based on *Renoutria japonica* Houtt. will be necessary. Those who recognize *Polygonum, sensu latiore*, should use the binomial *P. cuspidatum* Sieb. & Zucc. For notes on the validity of the latter name, under *Polygonum*, see Moldenke, l. c., and Rehder, Jour. Arnold Arb. xvii. 316 (1936). The species is a very common and widely distributed one in eastern Asia and in Japan, and is naturalized in various parts of the eastern United States.

Umbelliferae

Torilis japonicus (Houtt.) DC. Prodr. iv. 219 (1830); Buwalda, Blumea ii. 169 (1937). *Caucalis japonicus* Houtt. Nat. Hist. II. viii. 42, *t. 45, f. 1* (1777); Christm. Pflanzensyst. vi. 45, *t. 45, f. 1* (1780). *Tordylium Anthriscus* Linn. Sp. Pl. 240 (1753). *Caucalis Anthriscus* Huds. Fl. Angl. 99 (1762), ed. 2, 114 (1778), Britt. & Br. Ill. Fl. North. U. S. ii. 54, *f. 2634* (1897). *Torilis Anthriscus* Gmel. Fl. Bad. i. 613 (1805); Britt. & Br. Ill. Fl. North. U. S., ed. 2, **2**: 626, *f. 3106* (1913); Thellung in Hegi, Ill. Fl. Mittel-Eur. v. pt. ii. 1051. 1926, non Gaertn. (1788), nec Bernh. (1800).

Linnaeus described two similar but distinct species with the same specific name, *Tordylium Anthriscus* and *Scandix Anthriscus*. The *Tordylium* is the species here considered but the specific name is invalidated in *Torilis* by both Gaertner's and Bernhardt's use of the same epithet for a different species based on *Scandix Anthriscus*. *Scandix Anthriscus* Linn. has nothing to do with the species here considered, and is *Chaerefolium Anthriscus* (Linn.) Schinz & Thellung (*Torilis Anthriscus* Gaertn.; Bernh.). Under the International Code Houttuyn's specific name is the correct one for this very common and widely distributed Eurasian weed which occurs as an introduced and naturalized species in various parts of North America. There is a

specimen in the Delessert herbarium at Geneva, Switzerland, accredited in literature to Houttuyn; it may prove to be a Royen specimen, *i. e.* one from Royen's herbarium and named by him rather than by Houttuyn.

Labiatae

Trichostema setaceum Houtt. Nat. Hist. II. ix. 428 (1778). *Trichostema lineare* Walt. Fl. Carol. 164 (1788). *Trichostema lineare* Nutt. Gen. ii. 39 (1818); Britt. & Br. Ill. Fl. North. U. S. iii. 78, *f. 3074* (1898), ed. 2, iii. 105, *f. 3574* (1913). *Trichostema foliis setaceis* Gronov. Fl. Virgin. ed. 2, 90 (1762).

Houttuyn's hitherto overlooked binomial was based wholly on the Gronovius reference, which in turn was based on *Clayton 41* from Virginia. Mr. J. E. Dandy of the British Museum (Natural History) kindly examined Clayton's specimen at my request. He reports that the rather fragmentary material, of which a photograph was courteously supplied to me by Dr. J. Ramsbottom, was determined by Mr. C. A. Weatherby in 1935 to represent *Trichostema lineare* Nutt. Professor Fernald calls my attention to the fact that *Trichostema lineare* Nutt. was originally and correctly published by Walter as *T. lineare* Walt. thirty years before Nuttall independently described the same species under the same specific name. Houttuyn did not indicate his binomial as a new one, yet it antedates *T. lineare* Walt. by ten years. Christmann and Panzer did not recognize the species. *Trichostema setaceum* Houtt. occurs in dry sandy soil, pine barrens, etc. from Connecticut to Georgia and Alabama, mostly near the coast.

Scrophulariaceae

Pedicularis labradorica Wirsing, Ecolog. Bot. [2] *t. 10* (1778); Panzer, Pflanzensyst. viii. 39, *t. 57c* (1782); Fernald, Rhodora xxxiii. 193 (1931). *Pedicularis euphrasioides* Stephan in Willd. Sp. Pl. iii. 204 (1801); Britt. & Br. Ill. Fl. North. U. S. iii. 185, *f. 3332* (1898), ed. 2, iii. 220, *f. 3847* (1913). Plate 495.

This species was not included by Houttuyn in his treatment of *Pedicularis*, Nat. Hist. II. ix. 468–478 (1778). The "Index Kewensis" reference "[Panzer, in] Houtt. Pflanzensyst. viii. 39 = *euphrasioides*." is erroneous and incomplete. Fernald, in calling attention to the older name for *Pedicularis euphrasioides* Stephan, gives the reference as "Houttuyn, Pflanzensyst." This error in citation originated with Willdenow who gives it as "Houttuyn Lin. Pfl. Syst. 8. p. 39. *t. 57c.*" Panzer, in his translation of Houttuyn's work, added a description of this species, and interpolated two extra plates which he numbered

57b and 57c; the second of these is an excellent illustration of the species under consideration (see PL. 495), copied from "Ecl. bot." which he cites without giving the author of the work. This proves to be Wirsing's "Eclogicae botanicae" (1778), as verified by an examination of this work first by Mr. J. E. Dandy in the library of the British Museum, Natural History, and checked by me in the library of the New York Botanical Garden. Wirsing's hitherto overlooked description of *Pedicularis labradorica* is as follows:

"Caule ramoso, calycibus ore obliquo integro emarginato. Addimus hanc plantam, antea neque descriptam neque depictam, sed plane novam, quam e Labradoria accepimus. Color corollae flavus est. Accedit ad *Pedicularem caule ramoso, calycibus oblongis quinquefidis crenatis, floribus laxe spicatis.* Gmelin, *Fl. sibir. tom. 4. p. 203. t. 43.* sed pluribus notis ab ea differt."

This is the only species that Wirsing characterized as new in the work cited. It has been overlooked by all subsequent authors, or erroneously accredited to Houttuyn, who never considered the species. It occurs from Greenland and Labrador, through arctic America to British Columbia and Alaska, and also in northern Asia.

COMPOSITAE

EUPATORIUM RUGOSUM Houtt. Nat. Hist. II. x. 558 (1779). *Ageratum altissimum* Linn. Sp. Pl. 839 (1753), ed. 2, 1176 (1763). *Eupatorium urticaefolium* Reichard, Syst. Pl. iii. 719 (1780); Panzer, Pflanzensyst. ix. 245 (1783); Britt. & Br. Ill. Fl. North. U. S. ed. 2, iii. 361, *f. 4169* (1913). *Eupatorium ageratoides* Linn. f. Suppl. 355 (1781); Britt. & Br. Ill. Fl. North. U. S. iii. 312, *f. 3629* (1898). *Eupatorium altissimum* Murr. Syst. Veg. ed. 13, 614 (1774), non *E. altissimum* Linn. (1753).

Eupatorium rugosum Houtt. is a validly published new name based on *Ageratum altissimum* Linn.; it was not indicated by Houttuyn as new. The Linnaean binomial and the pre-Linnaean synonyms of Gronovius and Cornut are cited in the footnote. *Eupatorium ageratoides* Linn. f. (1781) was based on *Eupatorium altissimum* Murr. (1774), which in turn was based on *Ageratum altissimum* Linn. *Eupatorium urticaefolium* Reichard (1780) was also proposed as a new name for the same Linnaean species. Houttuyn in 1779, Reichard in 1780, and Linnaeus f. in 1781 all proposed new names, one year apart, for *Eupatorium altissimum* (Linn.) Murr., which was invalidated by the earlier *E. altissimum* Linn. (1753). The species occurs from Quebec westward to Nebraska and southward to Louisiana and Florida. *Eupatorium rugosum* HBK., an Ecuadorian species, needs a new name.

III. SMELOWSKIA AND POLYCTENIUM

Reed C. Rollins[1]

(Plate 496)

To students of the *Cruciferae* the accurate definition of genera is an acute problem. This is understandable when the uniformity of flower- and fruit-morphology is considered together with the apparent youth of the family. While this "naturalness" has become an enigma to those chiefly interested in developing a suitable classification, the same characteristic presents a fertile field of investigation for the phylogenist, since the differences between genera are sometimes relatively small and it is often possible to trace evolutionary trends within the family with considerable facility. However, an adequate and accurate system of nomenclature based upon all the available evidence must be built up before finality in a phylogenetic scheme for the family can be developed. Accordingly a program of research is under way which is designed to clarify the generic relationships of certain groups in the *Cruciferae* which occur in North America.

In addition to the usual methods in systematic botany a certain amount of micro-technique has been employed in the present study. Serial sections of flowers and fruits of *Smelowskia* and *Polyctenium* have been prepared for detailed examination. Since fresh material was not available, flowers and fruits from herbarium material were swelled to normal by leaving them over-night in a 5% solution of KOH. The tissues of the material were then softened by a 12-hour treatment with a ten percent solution of hydrofluoric acid. From this point the ordinary paraffin method of embedding and sectioning was employed. The sections were stained with safranin and fast green.

Probably the most useful and significant microscopical observations in a study of this nature are those which accurately establish the relative position of parts and organs. Thus it has been possible to show (Plate 496, fig. 14) that the long stamens in the flower of *Smelowskia* are proximal to the transverse long axis of the ovary, whereas the lateral short stamens are proximal to a line running across the short axis. In *Polyctenium* (Plate 496, fig. 2) the compression of the normal mature silique is the opposite. The long stamens are proximal to a median transverse line through the short axis of the silique and the short stamens are near a transverse line passed through

[1] The Society of Fellows of Harvard University.

the long axis. Thus the compression of the silique is contrary to the septum in *Polyctenium* and parallel to it in *Smelowskia*. Serial sections of young and old flowers show these differences to be constant for the two genera, and, although it might be argued that a change from one type of orientation to the other is relatively simple, yet such an accomplished change is highly important when considered together with correlated changes which accompany it. *Smelowskia* and *Polyctenium* are clearly related genera, though there is little evidence to indicate that their entire history has been similar. *Smelowskia* is essentially an arctic-alpine genus with two areas of concentration, the Cascade and Rocky Mountains of western North America and the Altai and adjacent ranges of Siberia and the Turkestans. The genus extends as far south as Mt. Lassen in the Sierra Nevada of California and to southern Colorado in the Rocky Mountains. *Polyctenium*, on the other hand, inhabits a unified semiarid area at relatively low elevations in northeastern California, southern and eastern Oregon and western Idaho. Further evidence of the distinctness of these two genera may be found in the number of ovules, length of funiculus, size of seed, petal-shape, type of foliage and general habit of growth. The leaves of *Smelowskia* are petiolate, pliable and usually covered with a dense whitish tomentum; the plants are caespitose, with the caudices covered by leaf bases; the petals differentiated into claw and rounded blade; the funiculus short (less than 1 mm.) and stubby; the ovules 2–10, maturing to relatively large seeds (2 mm. long). *Polyctenium*, on the other hand, has non-petiolate, highly dissected, wiry leaves with linear segments; sparse, never whitish, pubescence; caudices free of leaf-bases; and truncate petals which taper from apex to base. A weak funiculus 1 mm. long attaches the small (1 mm. long) seed to the replum and 12–28 ovules are present in the silique.

In 1875 Watson[1] described a plant from southern Oregon as *Smelowskia ? Fremontii*. Appended to the description he says "it much resembles *S. calycina* in habit, but the characters of the fruit do not fully accord with those of the genus." It is significant, in light of subsequent treatments and as confirmatory evidence for the present study, that he considered the plants to be somewhat anomolous in *Smelowskia*. Though Robinson (Syn. Fl.) admitted this species to *Smelowskia* without qualification, Greene,[2] upon encountering the

[1] Watson, Proc. Am. Acad. Arts & Sci. ii. 123 (1875).
[2] Greene, Erythea iii. 69 (1895).

same biological unit, described it as a new species of *Braya* to which genus it is not particularly related. He later recognized his own plants to be conspecific with those of Watson, but refused even then to admit them to the genus *Smelowskia*. In describing *Polyctenium* as a new genus, Greene[1] said in part, "to the eye of experience there is not a suggestion here of the genus *Smelowskia*, which are not only soft-wooly herbs, but their herbage is soft as to texture, that is, it is yielding or pliable, whereas in *Polyctenium* it is in every part rigid, wiry as to the stems and as to the leaves stiffly acerose." Thus with a strong emphasis on habital and vegetative characteristics but without a thorough examination of the morphology of flower and fruit, the genus *Polyctenium* was created; at the same time two new species were described and attributed to it. The superficiality of Greene's observations does not alter the fact that he was correct in separating these two genera. Subsequent treatments of *Smelowskia* have included *Polyctenium* as a synonym, though O. E. Schulz[2] gave it the rank of a section. In view of this lack of uniformity of treatment and clear elucidation of the facts involved, the objects of the present study were: (1) to determine the facts of floral morphology, (2) to use these criteria to establish the two units as a single genus or as two genera, as the facts dictated, and (3) to present a systematic treatment of this group for North America.

It is a pleasure to acknowledge my indebtedness to Professor M. L. Fernald, Director, and other members of the staff of the Gray Herbarium, where facilities for study have been made readily available and constantly at my disposal. That portion of the work which involved micro-technique was done in the laboratory of Professor R. H. Wetmore. An expression of appreciation is made to the curators of the following herbaria, who have generously loaned specimens or allowed me the privilege of examining material in their care: University of California (C); Missouri Botanical Garden (M); University of Notre Dame (ND); New York Botanical Garden (NY); Rocky Mountain Herbarium (RM); United States National Herbarium (US); University of Washington (UW). Specimens cited (G) or not otherwise designated are in the Gray Herbarium of Harvard University. Collections from my own herbarium are designated (R).

[1] Greene, Leafl. ii. 219 (1912).

[2] O. E. Schulz in Engler, Pflanzenr. iv[105]. 358 (1924).

SYNOPSIS OF SMELOWSKIA IN NORTH AMERICA

a. Mature fruits oblong, tapering at both ends, 5–12 mm. long; seeds 4–10; basal leaf-bases strongly ciliate with long acicular hairs; lobes of basal leaves oblong or cuneate, rarely dissected to mid-rib; stems simple. . . . . *S. calycina* & vars.
  b. Cauline leaves entire or trilobate at apex; basal leaves entire or remotely toothed, less than 2.5 cm. long; inflorescence lax-corymbose; plants of Alaska and Siberia adjacent to the Bering Strait. . . . . var. *integrifolia.*
  b. Cauline leaves pinnatifid; basal leaves pinnately dissected or tending to become entire, more than 2.5 cm. long; inflorescence congested-corymbose. . . . . var. *typica.*
a. Mature fruits ovate to slightly oblong, truncate at base, 3–6 mm. long; seeds 2–6; basal leaf-bases lacking pronounced ciliation; lobes of basal leaves ovate and dissected to mid-rib, stems often branched. . . . . *S. ovalis* & vars.
  c. Plants densely caespitose, clothed in long simple hairs; fruits 4–6 mm. long; plants of northern California. . . . . var. *congesta.*
  c. Plants less dense; leaf-blades with a short, often branched pubescence; fruits 2–4 mm. long. . . . . var. *typica.*

S. CALYCINA (Stephan) C. A. Meyer. Perennial, caespitose, the multiple caudex clothed with old leaf-bases; stems several to numerous, simple, pubescent with short branched and long simple hairs, 5–15 cm. long; basal leaves numerous, petiolate, pinnately divided or very rarely almost entire, segments oblong to cuneate, densely clothed with a whitish, chiefly branched, pubescence, bases strongly ciliate with long white acicular hairs; cauline leaves similar but nearly sessile, few, the lobes more linear, tending to be reduced upwards on the stem, 1–3 cm. long; pedicels ascending, pubescent with long simple hairs, 5–10 mm. long; sepals pubescent, oblong, 2.5–3.5 mm. long, 1–1.5 mm. wide; petals white, rounded at apex, differentiated into claw and blade, 5–7 mm. long, 3–4 mm. wide; pods linear to oblong, tapering at both ends, glabrous or rarely pubsecent with simple hairs, slightly flattened parallel to septum or nearly terete, 5–12 mm. long, 1.5–2.5 mm. wide, style 1.5 mm. or less, valves nerved from base to apex, stigma expanded; seeds few (4–10), marginless, 2 mm. long, funiculus short and stout, cotyledons incumbent.

Var. **typica.** *S. calycina* C. A. Meyer in Ledeb. Fl. Alt. iii. 170 (1831); Gray, Proc. Acad. Nat. Sci. Phila. no. 43: 58 (1863); Watson, U. S. Geol. Expl. (fortieth parallel) v. 24 (1871); Parry in Hayden, U. S. Geol. Surv. Wyo. 484. (1871); Porter & Coulter, Syn. Fl. Colo. 8 (1874); Macoun, Catal. Canad. Pl. i. pt. 1: 56. 490 (1883); Coulter, Man. Bot. Rky. Mt. Reg. 24 (1885); Tweedy, Fl. Yellowst. Nat. Park 28 (1886); Macoun, Check-List Canad. Pl. 10. (1889); Nelson, Bull. Wyo. Exp. Sta. 28: 83 (1896); Howell, Fl. Northw. Am. i. 57 (1897) in part; Rydb. Mem. N. Y. Bot. Gard. i. 183 (1900); Piper, Contrib. U. S. Nat. Herb. xi. 300 (1906); Brown, Alp. Fl. Canad. Rky. Mts. 121 (1907) t. xxxi; Frye & Rigg, Northw. Fl. 189 (1912); Clements & Clements, Rky. Mt. Flowers, 27 (1914); G. N. Jones, Univ. Wash. Publ. Biol. v. 161 (1936), including *S. ovalis. S. calycina* prol.

americana O. E. Schulz in Engler, Pflanzenr. iv[105]. 356. (1924) & Pflanzenf. xviib. 656 (1936). *Lepidium calycinum* Stephan in Willd. Spec. Pl. iii[1]. 433 (1801). *Hutchinsia calycina* Desv. Journ. Bot. iii. 4. 168 (1814); DC. Syst. ii. 388 (1821) & Prodr. i. 178 (1824); Hook. Fl. Bor.-Am. i. 58 (1830) t. xvii. fig. B; T. & G. Fl. North Am. i[1]. 114 (1838); Ledeb. Fl. Ross. i. 200 (1842). *H. calycina* β *americana* Regel & Herder, Bull. Soc. Nat. Mosc. xxxix[2]. 101 (1866) excl. pl. Alaska & Oreg. *S. americana* Rydb. Bull. Torr. Bot. Club xxix. 239 (1902); Blankinship, Mont. Agric. Col. Sci. Studies i. 2. 60 (1905); Rydb. Fl. Colo. 153 (1906); Coulter & Nelson, New Man. Bot. Centr. Rky. Mts. 224 (1909); Rydb. Fl. Rky. Mts. 329 (1917); Henry, Fl. So. Br. Columb. 142 (1918); Standley, Contrib. U. S. Nat. Herb. xxii[5]. 346 (1921); Tidestrom, Contrib. U. S. Nat. Herb. xxv. 239 (1925); Standley, Pl. Glac. Nat. Park, 45 (1927), fig. 58. *S. lineariloba* Rydb. Bull. Torr. Bot. Club, xxxi. 555 (1904) and Fl. Colo. 153 (1906); Cockerell, Am. Nat. xl. n. 480: 865 (1906); Rydb. Fl. Rky. Mts. 329 (1917); Holm, Mem. Nat. Acad. Sci. Wash. xix. 9 (1923); Schulz, l. c. 357 and Das Pflanzenf. xviib. 656 (1936); Graham, Ann. Carneg. Mus. xxvi. 222 (1937). *S. lineariloba* f. *virescens* Schulz l. c. *S. lobata* Rydb. Bull. Torr. Bot. Club xxxix. 327 (1912); Rydb. Fl. Rky. Mts. 329 (1917).—Southern Colorado and Utah to Washington, British Columbia and Alberta and in the Altai region of south-central Siberia. Canada: locality uncertain, Palliser's Brit. N. Am. Exp., Rocky Mts. 1858, *E. Bourgeau* (NY, G, type & isotype of *S. lobata* Rydb.). Alberta: Sheep Mt., July 1895, *Macoun 10315;* Elbow River, June–Jul. 1897, *Macoun 18172;* Crow Nest, lat. 49° 30′, Aug. 1897, *Macoun* (ND); north of Kootenai Pass, July 1883, *Dawson.* British Columbia: Skagit Valley, July 1905, *Macoun 70847;* 40–50 miles sw. of Banff, Jul.–Aug. 1905, *B. P. Clark.* United States: exact locality unknown; Rky. Mts. lat. 49° n. 1861, *Lyall;* sw. Calif. to so. Utah, May–Oct. 1898, *C. A. Purpus* (C). Montana: Upper Marias Pass, Aug. 1883, *Canby 32;* Bald Mt. July 1880, *S. Watson 36;* McDonald's Peak, July 1883, *Canby 32;* Spanish Peaks, July 1901, *J. Vogel;* Glacier Park, Gunsight Mt., Aug. 1919, *Somes 31* (NY); Glacier Park, Baring Basin, July 25, 1933, *McLaughlin 2904* (UW). Wyoming: Saltlick Mt., ne. of Kendall, Aug. 1922, *E. B.* & *L. B. Payson 2952* (G, RM); the Thunderer, Yellowstone Nat. Park, July 1899, *A.* & *E. Nelson 5821* (G, RM); Teton Pass Mts., July 1920, *E. B.* & *L. B. Payson 2095* (G, RM); Wind River Mts., July 1922, *E. B.* & *L. B. Payson 2890* (G, RM); Red Mt. ne. of Smoot, July 1923, *Payson* & *Armstrong 3629* (G, RM); nw. Wyo. 1873, *Parry 17;* Laramie, July 1891, *Nelson 5;* Frozen Lake, Park Co., July 1937, *L. O.* & *R. P. Williams 3584* (R). Colorado: Rky. Mts. lat. 39°–41°, 1862, *Hall* & *Harbour;* near Trout Lake, San Miguel Co., Aug. 1924, *E. B.* & *L. B. Payson 4181* (G, RM); Ethel Peak, Larimer Co., Aug. 1903, *Goodding 1888* (G, RM); Mt. nw. of Como, July 1895, *Crandall* & *Cowan 66;* La Plata Mts., July 1898, *Baker, Earle* & *Tracy 580* (G, isotype of *S. lineariloba* f. *virescens* O. E.

Schulz); Douglass Mt., 1878, *M. E. Jones 447* (NY, type of *S. linearilobа* Rydb.); Hamilton Pass, Aug. 1875, *E. L. Greene 671*. IDAHO: Smoky Mts., Blaine Co., Aug. 1916, *Macbride* & *Payson 2733* (G, RM); south end Soldier Mts., June 1916, *Macbride* & *Payson 2889* (G, NY, RM); Mt. Hyndman, July 30, 1936, *Thompson 13,631;* Henry Lake, Fremont Co., July 1920, *E. B.* & *L. B. Payson 1958* (G, RM); Stevens Peak, Aug. 1895, *Leiberg 1480*. UTAH: Ridge nw. Paradise Park, Uinta Basin, July 1933, *Graham 8433;* Big Cottonwood Canyon, Salt Lake Co., June 1905, *Garett 1301;* July 1905, *Rydberg 6821;* American Fork Canyon, July 1885, *Leonard;* Uinta Mts., Aug. 1869, *S. Watson 100;* July 1926, *E. B.* & *L. B. Payson 4916* (G, RM); La Sal Mts., July 1924, *E. B.* & *L. B. Payson 3982* (G, RM). NEVADA: East Humboldt Mts., Aug. 1868, *S. Watson 100;* Sept. 1868, *S. Watson 100*. OREGON: Wallowa Mts., Aug. 1886, *Cusick 1347* (C, G). WASHINGTON: Mt. Stuart, Aug. 1883, *T. S. Brandegee 641;* July 1931, *Thompson 7679;* Olympic Mts. Jefferson Co., Aug. 1931, *Thompson 8002;* Mt. Angeles, Clallam Co., July and Aug. 1931, *G. N. Jones 3171* and *3799* (UW); June 1932, *Thompson 8389;* July 1931, *Thompson 7386* and *7394;* Hurricane Ridge, June 1934, *Thompson 10591* (G, UW); Sept. 6, 1937, *Thompson 14,214* (R); Olympic Mts., 1889, *J. M. Grant*.

Ever since Rydberg[1] published *S. americana* after having made the following observation, "while in Europe last summer, I looked up the Asiatic type of *S. calycina* and this differs considerably from ours in the long villous pubescence," many botanists have hesitated to associate the plants of North America specifically with those of Siberia. The fact that the author neither amplified nor elucidated his statement, leaves much to be desired, since anyone familiar with our plants knows that the pubescence of the upper stem, pedicels and sepals is of a "long villous" type. This point, insignificant at the outset, is of no value in separating the plants from the two areas. My studies on this problem have revealed two very minor quantitative differences, both of which are covered by the natural variation in American plants and would likely lose even the slight conspicuousness here recorded, if a larger series of Asiatic specimens were considered. The average length of the style is a fraction of a millimeter longer and the pod averages 1–2 mm. shorter in the Siberian plants than in those from this country. However, on the whole, plants from the two continents are so similar in all important morphological features that they cannot be satisfactorily maintained as even varietally distinct.

Several variations of minor importance, as illustrated by a large series of specimens, may well be noted with profit. Plants from the

[1] Rydberg, Bull. Torr. Bot. Club xxxix. 239 (1902).

Olympic Mountains of Washington and from northern Montana extending northward tend to be whitish from a very dense pubescence. That this is probably a climatological response is indicated by the fact that a gradual reduction in the amount of indument may be observed on specimens from localities proceeding from north to south along the Rocky Mountain axis. Rydberg gave weight to the abundance of vestiture in describing *S. lobata*, while O. E. Schulz described *S. linearilobа* f. *virescens* largely on the basis of a reduced amount of pubescence. Neither of these forms seem to merit nomenclatorial rank, however, since the distinguishing characters attributed to them are either unstable or of very minor significance. The fruits vary in length as does the length of the style. For example, the short pods (5–6 mm.) and styles (less than 1 mm.) found on the type-specimen of *S. lobata* from British North America, are also found on specimens from Wyoming (*Payson & Payson* 2952) and much farther south in Utah (*Payson & Payson* 3982) neither of which exhibit the supposedly distinctive correlated characters. Leaf-shape and degree of lobation are highly variable, lacking correlation with stable features and occurring at various geographical points throughout the range of the species. Thus it seems clear that *S. linearilobа*, founded chiefly on length of pod and leaf-lobation, *S. linearilobа* forma *virescens*, founded on scantiness of pubescence, and *S. lobata*, founded largely on abundance of vestiture, leaf-lobation and length of silique and style, should be included under the variable but understandable *S. calycina*.

Var. **integrifolia** (Seemann), comb. nov. Leaves entire or divided toward apex only, spatulate to somewhat cuneate, petiolate, 1–2.5 cm. long, 2–7 mm. wide; stems 5–12 cm. long; inflorescence lax-corymbose; pedicels 5–10 mm. long, spreading; siliques ellipsoidal, narrowed toward base, glabrous, valves nerved; style less than 1 mm. long; seeds oblong, 2 mm. long, 1 mm. broad, 2–4 in each silique.—*Hutchinsia calycina* var. *integrifolia* Seemann, Bot. Voy. Herald 25 (1852). *H. calycina* var. β, Hook. Fl. Bor.-Am. i. 59 (1830); Hook. & Arnott, Bot. Beechey's Voy. 122 (1832); T. & G. Fl. No. Am. i. 114 (1838). *H. calycina* var. γ, Ledeb. Fl. Ross. i. 201 (1842). *Smelowskia calycina* Robinson in Gray, Syn. Fl. No. Am. i. 136 (1895) in part. *S. calycina* prol. *americana* f. *integrifolia* O. E. Schulz in Engler, Pflanzenr. iv[105]. 356 (1924).—Western coast of Alaska and eastern coast of Siberia (?) adjacent to Bering Strait. Alaska: Port Clarence, July 1899, *Trelease & Saunders 3986* (M); Anvil Peak near Nome, July 1936, *G. N. Jones 9094;* July 8 and Aug. 16, 1900, *Flett 1631* (UW). Siberia: Plover Bay, 1881, *John Muir 228* (G, this fragmentary specimen not certainly determinable as var. *integrifolia* but presumably belonging here).

First described as var. β under *Hutchinsia calycina* by Hooker, this entity, originally collected on Cape Mulgrave by Lay & Collie, has received a variety of unsatisfactory treatments. Torrey & Gray and Ledebour followed Hooker in separating the unit as a variety with entire leaves but failed to give it a name. Seemann, in enumerating his collections from Alaska, designated a plant from Cape Kruzenstern as var. *integrifolia*, citing Hooker's description of var. β and erroneously ascribing the name to him. O. E. Schulz correctly cited Seemann as the author of the name when relegating this unit to the status of a form; but, not having seen specimens, he apparently regarded the characters repeatedly emphasized by earlier workers as of only minor importance. Mature fruiting specimens show characters which well merit the rank of variety for this entity.

S. OVALIS M. E. Jones. Perennial, multiple caudex clothed with dead leaf-bases; stems simple or often branched, densely pubescent with a long simple and short branched pubescence, 5–15 cm. long; basal leaves petiolate, pinnately divided, segments obovate, densely clothed with a whitish chiefly branched pubescence, 2–6 cm. long; cauline similar, few, 1–3 cm. long; inflorescence corymbose, elongating but dense in fruit; pedicels ascending, densely pubescent with long simple hairs, 4–8 mm. long; sepals oblong, scarious-margined, hairy, 3–3.5 mm. long, 1–1.5 mm. wide; petals white, rounded at apex, differentiated into claw and blade, 4–5 mm. long, 2 mm. wide; pod glabrous, ovoid to ovate, 4–6 mm. long, 4 mm. broad, valves faintly nerved at base; style less than 1 mm. long; stigma expanded; seeds few (2–6), oblong but pointed on distal end, marginless, cotyledons incumbent.

Var. **typica**. *S. ovalis* M. E. Jones, Proc. Calif. Acad. Sci. v². 624 (1895); Piper, Mazama ii². 109 (1900); Piper, Contrib. U. S. Nat. Herb. xi. 301 (1906); Frye & Rigg, Northwest Fl. 189 (1912); Piper & Beattie, Fl. Nw. Coast, 174 (1915); Rydb. Fl. Rky. Mts. 329 (1917); Flett, Fl. Mt. Rainier, 47 (1922); O. E. Schulz in Engler, Pflanzenr. iv¹⁰⁵. 357 (1924) and Pflanzenf. xviib. 656 (1936); St. John & Warren, Am. Midl. Nat. xviii. 969 (1937).—Cascade Mountains of Oregon and Washington.[1] OREGON: Three Sisters, 1881, *L. F. Henderson.* WASHINGTON: Mt. Adams, Aug. 12, 1882, *Howell 3846* (US, type; M, NY, isotypes)[2]; Sept. 1877, *Suksdorf;* July 1899, *Flett* (US); Aug. 1892, *L. F. Henderson* (UW); Aug. 1894, *Lloyd* (NY); Mt. Rainier,

[1] *S. ovalis* is cited from the Olympic Mts. by G. N. Jones, Univ. Wash. Publ. Biol. v. 161 (1936). However, I have recently consulted with Dr. Jones and we have concluded that the specimens on which the report was based are immature *S. calycina*.

[2] The only specimen from Mt. Adams collected on Aug. 12, in the U. S. Nat. Herb., is that of Howell. M. E. Jones l. c. gave the year of the type-collection as 1892; however, even though Howell's specimen bears the date 1882, it is selected as the type since there seems to be no other alternative.

Aug. 1897, *Merriam* (US); Aug. 1895, *Piper 2063* (US); Aug. 1934, *Thompson 11,087* (G, M, UW); Aug. 1933, *Thompson 10,000* (G, NY, US, UW); Aug. 1901, *Flett 1999* (NY); Aug. 1892, *Allen 61;* July 1937, *G. N. Jones 10,325;* Indian Head Peak, Chelan Co., July 1921, *St. John 4839* (G, M, NY); Mt. Maude, Chelan Co., Aug. 1933, *Morrill 335* (UW); Mt. Stuart, July 1931, *Thompson 7679* (NY, US); July 1898, *Elmer 1095* (US); 1883, *Brandegee 641* (US); head of Ingals Cr., Aug. 1898, *Whited 838* (US); Wenatche region, Aug. 1883, *Tweedy 865* (US); above Hidden Lakes, Okanogan Co., Aug. 1916, *McDaniels 13,469* (US); Burch Mt., Okanogan Co., June 1934, *Thompson 10,837* (G, NY, UW); Fremont Mt., Pierce Co., July 1934, *Thompson 11,087* (M).

Var. **congesta** var. nov., caespitosa incana pubescenti-tomentosa; siliculis ovatis 4–6 mm. longis; stylo ± 1 mm. longo. Caespitose, pubescent throughout with long simple hairs; inflorescence corymbose, elongating only slightly in fruit; petals white or pinkish; pods ovate, truncate at base, tapering at apex; style ± 1 mm. long.—*S. calycina* Brewer & Watson, Bot. Calif. i. 42 (1876); Greene, Fl. Francis. 252 (1891) as to Calif. Pl. cited; Jepson, Man. Fl. Pl. Calif. 427 (1925) as to Calif. pl. cited; Jepson, Flora Calif. ii. 59 (1936) as to pl. cited. *S. ovalis* Rydb. Fl. Rky. Mts. 329 (1917) as to Calif. range; O. E. Schulz, l. c. as to Calif. pl. cited. California: Lassen Peak, Shasta Co., 1875, *Lemmon 21* (G, type; C, M, NY, isotypes); Aug. 1882, Mrs. *R. M. Austin* (C); undated, *Chestnut & Drew 189* (ND).

Isolated nearly two hundred and fifty miles south of the nearest known collection of var. *typica*, this natural entity seems to have stabilized itself sufficiently to receive nomenclatorial designation. The outstanding characteristics are those of the pubescence which is of a long-villous type, covering the above-ground parts of the plants except the petals and fruits, and the siliques which are larger, longer, tapering at apex and tipped with a longer style than in var. *typica*.

Smelowskia ovalis is perfectly distinct from *S. calycina* with which it has been confused by some botanists. It is true that there is a marked superficial resemblance between specimens of the two species at anthesis or even when the fruits are young, but a closer scrutiny has consistently revealed differences which have been emphasized in the key and which are of a constant nature. The pronounced acicular hairs along the margins of the leaf-bases of *S. calycina* are exceedingly useful in determining vegetative or young specimens. In fruiting specimens a useful character for easy differentiation is found at the apex of the replum after the valves have been removed. In *S. ovalis* the replum forms an obtuse angle beneath the style, while in *S. calycina* the angle is invariably acute.

Var. *typica* of *S. ovalis* shows a perplexing variation in length and shape of pod and length of style, but a complete transition between the extremes has been repeatedly observed. *Thompson* 10,837 and *G. N. Jones* 10,325 from Mount Rainier, *Thompson* 10,837 from Burch Mt. and *Suksdorf's* specimen from Mount Adams all have pods which tend to be lanceolate, often approaching 4 mm. in length, and styles which usually approximate 1 mm. in length. However, the two Thompson collections show an almost complete transition from the ovoid short-styled pod more characteristic of the typical form of the species to the condition described above. Since these deviations from typical *S. ovalis* are neither stable nor geographically localized, they may be regarded as illustrating the natural variation of the species. This tendency of *S. ovalis* to vary toward *S. calycina* in pod-length and -shape as well as length of style points to its probable recent origin from the latter species. Assuming *Smelowskia* to have originated in south-central Siberia, where the largest number of species exist at the present time, the migration-route through Alaska to the Cordillera of North America is marked by the relict *C. calycina* var. *integrifolia*. This variety, now isolated from the parent species from both west and south, has been differentiated to its present biological status under environmental conditions strikingly different from those of the Altai and the Cordillera of our west, which have tended to preserve the specific nature of *S. calycina* var. *typica* in the two areas. It seems highly probable from the present geographic distribution of *S. calycina* that it formerly extended without disruption from the Altai to the Cordillera. From the restricted area in which *S. ovalis* is found, one might conclude that differentiation from the parent species took place after the genus had migrated well down onto the Cordilleran mountains.

Smelowskia ovalis reputedly grows at the highest elevation at which phanerogamic plants are found on Mount Rainier and other peaks of the Cascade Range.

Synopsis of the Genus Polyctenium

a. Pods somewhat bisulcate, decidedly flattened, pubescent at least when young, 5–8 mm. long, 1.5–2 mm. wide; plants rather densely pubescent..... *P. Fremontii* var. *bisulcatum.*

a. Pods not bisulcate, flattened or nearly terete, glabrous, 6–13 mm. long, 1–1.5 mm. wide; plants sparsely pubescent *P. Fremontii* var. *typica.*

P. Fremontii (Watson) Greene. Perennial, more or less caespitose; stems few to several from a branching naked caudex, simple or rarely

branched, sparsely to abundantly pubescent with simple or branched hairs, 5–15 cm. long; basal leaves sessile, 1–2 cm. long, pinnately divided into linear divisions, pubescent with stiff simple or forked or dendritic hairs, segments pungent; cauline similar, sessile, several to many, 5–12 mm. long; pedicels ascending, pubescent or glabrous, 4–6 mm. long; inflorescence corymbose, becoming racemose in fruit; sepals oblong, glabrous or slightly pubescent, 2–3 mm. long, 1–1.5 mm. broad; petals white, cuneate, truncate at apex, 5–6 mm. long, 3–4 mm. broad; pods glabrous, flattened contrary to septum or nearly terete, 6–13 mm. long, 1–1.5 mm. wide; style less than 1 mm. long, stigma unexpanded; seeds numerous (12–28), marginless, 1 mm. long, attached by a weak funiculus 1 mm. long, cotyledons incumbent.

Var. **typicum**. *P. Fremontii* Greene, Leafl. ii. 219 (1912). *Smelowskia ? Fremontii* Watson, Proc. Am. Acad. Arts & Sci. xi. 123 (1875). *S. Fremontii* Brewer & Watson, Bot. Calif. i. 42 (1876); Robinson in Gray, Syn. Fl. No. Am. i^{1}. 136 (1895); Howell, Fl. Northw. Am. i. 57 (1897); Frye & Rigg, Northw. Fl. 189 (1912); Schulz in Engler, Pflanzenr. iv^{105}. 358 (1924); Jepson, Man. Fl. Pl. Calif. 427 (1925); Tidestrom, Contrib. U. S. Nat. Herb. xxv. 239 (1925); Jepson, Fl. Calif. ii. 59 (1936). *S. Fremontii* var. *glabella* Schulz l. c. 359. *Braya pectinata* Greene, Erythea iii. 69 (1895). *P. glabellum* Greene, l. c.—Northern California and southern and eastern Oregon to central Idaho. Idaho: Sawtooth Nat. Forest, 1910, *C. N. Woods 28* (RM). California: without locality, 1873, *J. G. Lemmon;* Ewing Creek, Modoc Co., May 1894, Mrs. *R. M. Austin* (C, type of *Braya pectinata* Greene); Modoc Co., May 1879, Miss *S. A. Plummer;* Portola, Plumas Co., July 1911, *K. Brandegee* (C); Plumas Co., June 1878, Mrs. *R. M. Austin;* Eagle Lake and Madeline Plains, Lassen Co., *J. G. Lemmon* (C); Bray, Siskiyou Co., May 1913, *L. E. Smith 227*. Oregon: head of Dry Creek, Malheur Co., May 1896, *Leiberg 2147* (US, NY, type and isotype of *P. glabellum* Greene); camp at Dry Creek, Crook Co., June 1894, *Leiberg 336* (C, G); base of Steens Mts., May 1885, *Howell 351;* June 1885, *Cusick 1246;* hills about Lake Klamath, Klamath Co., May 1846, *Fremont 384* (G, type); Swan Lake Valley, Klamath Co., May 1896, *Applegate 41;* stony dry swales of desert, Harney Co., June 1901, *Cusick 2612* (C, G); 7 mi. west of Riley, Harney Co., May 1914, *Mrs. R. D. Cooper;* north end of Summer Lake, Lake Co., June 1911, *Eggleston 6856a;* Bear Valley, Blue Mts., May 1885, *Howell 769* (C); Prineville to Button Springs, June 1894, *Leiberg 336* (US).

Var. **bisulcatum** (Greene), comb. nov. Caespitose, rather densely pubescent with branched hairs; sepals pubescent; pods decidedly flattened contrary to replum, pubescent at least when young, somewhat bisulcate, 5–8 mm. long, 1.5–2 mm. wide.—*P. bisulcatum* Greene, Leafl. ii. 220 (1912). *Smelowskia Fremontii* var. *bisulcata* O. E. Schulz op. cit.—Known only from the type-collection, Oregon: Silvies Valley, Blue Mts., May 1885, *Howell 346* (US, type; G, NY isotypes).

Polyctenium Fremontii is reasonably homogeneous and occupies a geographical area which is unbroken by any major barrier. As the species is here interpreted, the natural variation easily includes Greene's *P. glabellum* which appears to be only a lax form developed as a result of shading or perhaps the receipt of a larger amount of water than the species normally obtains. Indeed Leiberg's notation "along streams" on the type-specimen is significant in this connection, since the species is usually found in a dry habitat. The laxity of habit, inflorescence and foliage, the branching stems and scanty pubescence of Greene's type are approached by a specimen collected in June 1894, between Prineville and Button Springs, Oregon, by Leiberg. These characters, though not quite typical, are possessed to a lesser extent by other plants throughout the natural range of the species. Thus it is evident that *P. glabellum* should be considered synonymous with the older *P. Fremontii*, even though Schulz, op. cit., who saw no specimens, retained it as a variety.

Possessing many features in common with *P. Fremontii* but with short, flattened, pubescent and somewhat bisulcate pods, *P. bisulcatum* Greene appears sufficiently distinct to require nomenclatorial recognition, but in varietal rank. A specimen, loaned for study by the Herbarium of the University of California and possessing short obtuse pods, a prominent style and other minor characters, was collected by Mrs. R. M. Austin in California. This specimen, probably representing a new and undescribed variety, is related to var. *bisulcatum* by virtue of its short pods but is otherwise distinctive. It is left undescribed because the material is fragmentary and accurate data are lacking.

Explanation of Plate 496[1]

A, Polyctenium. Figs. 2–10: Polyctenium Fremontii var. typicum. Figs. 11–13: P. Fremontii var. bisulcatum. Fig. 2: diagram of a transverse section, at lower filament-level, of a young flower, *c* sepal, *p* petal, *ls* long stamen, *ss* short stamen, *s* septum, *g* gynoecium. Fig. 3: diagram of transverse section through mature silique. Figs. 4 and 5: two lateral views (at right angles to each other) of a mature silique. Fig. 6: transverse section of a seed. Fig. 7: sepal. Fig. 8: petal. Fig. 9: lateral view of seed. Fig. 10: stamen.

B, Smelowskia. Figs. 14–17 and 22–27: Smelowskia calycina var. typica. Fig. 18: S. ovalis var. congesta. Figs. 19–21: S. ovalis var. typica. Fig. 14: diagram of a transverse section, at lower filament-level, of a young flower, symbols as in fig. 2. Fig. 15: diagram of a transverse section through mature silique. Fig. 16: lateral view of a mature silique. Figs. 17, 18 and 19: lateral view of replum of three entities. Fig. 20: lateral view of silique. Fig. 21: lateral view of seed.

[1] All figures × 3½, except 2, 3, 14, and 15 which were drawn free-hand from a microscopic enlargement.

IV. THE NAMES OF THREE SPECIES OF BRASSICA

Louis C. Wheeler

Three mustards introduced as weeds in North America are commonly known under untenable names. They have been known as *Brassica alba* (L.) Rabenhorst, *B. arvensis* (L.) Rabenhorst, and *B. adpressa* (Moench) Boiss. Under *Sinapis* the first two are perfectly valid. But *Sinapis* seems scarcely worthy of generic rank. The following study of the nomenclature of these three species is based on the synonymy given by O. E. Schulz, Pflanzenreich IV. **105**(1):—1919. Of course the specific names cited under the varieties of each species are included in the elimination. The fact that Schulz considered the misapplication of a name as publication of a new species accounts for the large number of specific names attributed by him to various authors when the names were merely "*sensu*," i. e., misapplied.

Brassica hirta Moench, Suppl. Methodum Pl., 84. 1802. This is the earliest available name for what has long been known in American manuals under the name of *Brassica alba* (L.) Rabenhorst, Fl. Lusatica **1**: 184. 1839 (Boissier, Voy. Espagne **2**: 39. 1839–45 is more generally given as the combining author but the date of his publication is uncertain), based on *Sinapis alba* L., Sp. Pl. **2**: 668. 1753; not *Brassica alba* Gilibert, Fl. Lituanica. I have not seen this reference, cited "ii. 63" by Index Kewensis (also cited "IV. (1782) 63," by O. E. Schulz, l. c., 83.), but I have seen what is supposed to be the same paper in Uster, Delectus Opusculorum Bot. **2**: 361. 1785. Here Gilibert described his *B. alba* as a new species. There are the two following preoccupied names which are earlier than Moench's: *Raphanus albus* Crantz, Classis Cruciform. Emend., 109. 1769, proposed without reference to *Sinapis alba* L., though the same two pre-Linnaean polynomials are cited in both cases; not *Brassica alba* Gilibert, *vide supra*. "*Sinapis nigra* Kerner, Abbild. oekonom. Pflanz. V (1792) t. 465;" cited by Schulz, l. c., 130, but not confirmed, is preoccupied by *Brassica nigra* (L.) Koch, 1833, if it is not a mere misapplication of *Sinapis nigra* L.

Brassica **kaber** (DC.), comb. nov. *Sinapis kaber* DC., Syst. **2**: 617. 1821.

This is the plant that, under the genus *Brassica*, has commonly been called *B. arvensis* (L.) Rabenhorst, Fl. Lusatica **1**: 184. 1839, based on *Sinapis arvensis* L., Sp. Pl. **2**: 668. 1753; not *Brassica*

arvensis L., Mantissa, 95. 1767. *Sinapis orientalis* L., Cent. Pl. **1:** 19. 1755; not *Brassica orientalis* L., Sp. Pl. **2:** 666. 1753. "*Sinapis arvensis* Curtis, Fl. londin. 1. ed. II (1777–1787) t. 321," (Schulz, l. c., 123) was a mere varietal misapplication of *Sinapis arvensis* L. *Raphanus orientalis* Crantz, Classis Cruciform. Emend., 109. 1769, was published without reference to *Sinapis orientalis* L. but the same polynomial of Tournefort was cited under both; not *Brassica orientalis* L., 1753. *Sinapis torosa* Gilibert, Fl. Lituanica (reference not seen, given as "ii. 69" by Index Kewensis, and "IV. (1782) 69" by Schulz, l. c., 119) is an abortive name since, according to the transcript of the description kindly supplied by Mr. Ramsbottom of the British Museum, *Sinapis arvensis* L. was cited in synonymy. Illegitimate names are not to be taken into consideration for purposes of priority (Rules, Art. 60. 1935). "*S. nigra* Rozier, Dict. Univ. Agricult. VI. (1785) 676, t. 23;" (Schulz., l. c., 119) not seen, probably *S. nigra* L. *sensu* Rozier; if not, preoccupied by *Sinapis nigra* L., 1753. *Raphanus arvensis* Crantz, Classis Cruciform. Emend., 109. 1796, not based on *Sinapis arvensis* L. but description identical and the same two pre-Linnaean polynomials cited in synonymy, not *Brassica arvensis* L., 1767. "*Sinapis orientalis* Schkuhr, Bot. Handb. II. (1805) 264, t. 186, non L." (Schulz, l. c., 123–4) must be *S. orientalis* L. *sensu* Schkuhr. There are no authors cited by Schkuhr for adjacent species in this genus but in view of the fact that the *Sinapis* names are identical with those published by Linnaeus it seems reasonable to consider them as Linnaean species. Even if this were a new species it is preoccupied under *Brassica* by *B. orientalis* L., 1753.[1] "Raphanus raphanistrum Kerner, Oekon. Pfl. II. (1788) 98, t. 166, non L." (Schulz, l. c., 119) is probably a *sensu* name but the reference is not available. If it is new it is preoccupied by *R. Raphanistrum* L., 1753. "*S.*[*inapis*] *hispida* Balbis, Miscell. Bot. (1804–1806) 33, non Schousb." (Schulz, l. c., 123) is really a *sensu* name which traces nomenclatorially to *S. hispida* Schousb. which Schulz, l. c., 134, identifies with *S. flexuosa* Poiret. *Sinapis polymorpha* Generisch apud Schultes, Obs. Bot., 133. 1809, is an apparently abortive name seemingly based on *S. laevigata* L.; not *Brassica polymorpha* Murray "in Nov. Comment. Soc. Reg. Scient. Gotting. VII. (1776) 35 t. VI"

[1] The date given by Schulz, l. c., 123, for Schkuhr's Handb. seems to be in error. Pritzel lists two editions only and both are before me. Vol. 2, ed. 1, bears the date 1791, vol. 2, ed. 2, bears the date 1808. Pagination is identical at least for *Sinapis orientalis*.

(Schulz, l. c., 84), original not seen but the name checked in Linn. Syst. Veg. ed. **14:** 601. 1784. *Sinapis villosa* Mérat, Nouv. Fl. Envir. Paris, 265. 1812; not *Brassica villosa* Bivona-Bernardi, "Stirp. rar. Sicil. descr. Manip. IV. (1816) 20;" (Schulz, l. c., 38), not seen but confirmed in Sprengel, Syst. Veg. ed. 16, **4:** Cur. Post. 243. 1827. "*S.*[*inapis*] *taurica* Fischer!, Catal. Hort. Gorenk. (1812) 51; DC. Syst. II. (1821) 617 et Prodr. I. (1824) 219 (excl. Marsch. Bieb.)," (Schulz, l. c., 119), is another *sensu* name. This name was first published by Fischer in his Catalogue du Jardin des Plantes du Comte A. de Razoumoffsky à Gorenki, ed. **2:** 51. 1812, where it appears without description and is credited to M.[arschall von] B.[ieberstein]. As Fischer learned later, the plants raised in Razoumoffsky's garden from seeds sent by Marschall were not the plant which Marschall described in 1819, which was *Brassica geniculata* (Desf.) Ball, but *Sinapis arvensis*, as was shown by Fischer & Meyer, Index Seminibus Hortus Petropolitanus **1:** 38. 1835. It is easy for confusion to arise in plants raised from seeds. Garden labels may be misplaced or the wrong seeds may have been planted. Whatever caused the confusion, the error was not rectified in time to prevent de Candolle from drawing his description for the Systema and Prodromus at least in part from a specimen prepared by Fischer from the plant of the Razoumoffsky garden. This explains Schulz' citation. . . . "*S. incana* Kit. ap. Schultes, Österr. Fl. 2. Aufl. II. (1814) 265, non L.," (Schulz, l. c., 123) is really *S. incana* L. *sensu* Kit., for, through the reference "S. P. III. 558.," it traces through Willd., Sp. Pl. **3**(**1**)**:** 558. 1801 (date fixed by Rules, Art. 45. 1935), to L., Cent. Pl. **1:** 19. 1755. *Sinapis retrohirsuta* Besser apud Steudel, Nomencl. ed. **1:** 782. 1821, *nomen nudum.*

The specific name *Brassica kaber* applies to the plant called *Sinapis arveniss* L. var. *brevirostris* (Spach) O. E. Schulz. This is not the plant of America according to Schulz' interpretation. The two following varietal names apply to the plants of the New World:

Brassica kaber (DC.) Wh. var. **pinnatifida** (Stokes) comb. nov. *Sinapis arvensis* L. β *pinnatifida* Stokes, Bot. Mater. Medic. **3:** 478. 1812. Type-locality: apparently England. (*S. arvensis* α *integrifolia* Stokes, l. c., 477). This is typical *Brassica arvensis* (L.) Rabenhorst. (*B. sinapistrum* Boiss., Voy. Espagne **2:** 39. 1839–45, based on *Sinapsis arvensis* L.).

Brassica kaber var. **Schkuhriana** (Reichenb.) comb. nov. *Sinapis Schkuhriana* Reichenbach, Icones Fl. Germ. **2:** 20, t. 87, fig. 4425b. 1837–8. *S. arvensis* L. β *Schkuhriana* Reichenb. apud Hagenbach, Fl. Basil. Suppl., 138. 1843. *Brassica arvensis* (L.) Rabenh.

var. *Schkuhriana* (Reichenb.) Thellung apud Schinz & Keller, Fl. Schweiz. ed. 3, **2**: 131. 1914.

Brassica geniculata (Desf.) J. Ball in Journ. Linn. Soc. Bot. **16**: 327. 1878, based on *Sinapis geniculata* Desf., Fl. Atlantica **2**: 98. 1798.[1] Type-locality: North Africa.

This is the plant which has generally passed as *Brassica adpressa* (Moench) Boiss. in California, where it is a common weed. The following synonymy shows why *B. geniculata* is the valid name for this species. *Sinapis incana* L., Cent. Pl. **1**: 19. 1755, basis of *Brassica incana* (L.) Meigen, Deutschl. Fl. **3**: 270. 1842; not Tenore, Prod. Fl. Napol., p. xxxix. 1811–15 (not seen but kindly verified by Miss M. L. Green of Kew). *Raphanus incanus* Crantz, Classis Cruciform. Emend. 110. 1769, proposed without reference to *Sinapis incana* L. but doubtless identical since the same polynomial is cited; not *Brassica incana* Tenore, 1811–15. "*Sinapis incana* Jacq. Hort. Vindob. 2: 79, t. 169. 1772," cited by Schulz, l. c., 141, under *Hirschfeldia incana* (L.) Lagrèze-Fossat var. *hirta* (Babington) O. E. Schulz, is really *Sinapis* (or *Hirschfeldia*) *incana* L. *sensu* Jacq. which was merely a varietal misapplication. *Hirschfeldia adpressa* Moench, Method., 264. 1794 is an abortive name, since *Sinapis incana* L. was cited in synonymy, consequently this name is not to be considered for purposes of priority (Rules, Art. 60. 1935), and *Brassica adpressa* (Moench) Boiss., Voy. Bot. Espagne **2**: 38. 1839–45, must not be used since there are earlier available names. "*Sinapis nigra* Pallas, Tabl. Taurid. (1795) 54;" (Schulz, l. c., 137), is probably *S. nigra* L. (1753) *sensu* Pallas; if not, it is preoccupied both under *Sinapis* and under *Brassica*.

V. POLYGONUM KELLOGGII AND ITS ALLIES

Louis C. Wheeler

This paper presents a taxonomic synopsis of five small annual species of *Polygonum*, section *Avicularia*, of which *P. Kelloggii* Greene is the most widespread. The confusion as to the identity of the types of the species as well as to their delimitation makes this synopsis worth while. The following key summarizes the specific distinctions:

Anther-bearing stamens 8.
  Leafy bracts of inflorescence well differentiated from leaves of lower stem by an evident white margin and greater relative breadth.

[1] Stearn, Journ. Soc. Bibliogr. Nat. Hist. **1**: 147–8. 1938.

Inflorescence broadly oblong or ovoid, often nearly as broad as long ..... 1. *P. polygaloides.*
Inflorescence slenderly cylindric, 4–12 times as long as broad ..... 2. *P. esotericum.*

Leafy bracts of inflorescence little different from leaves of lower stem, white margin lacking generally, never more than a hairline ..... 3. *P. Watsonii.*

Anther-bearing stamens 3.

Plants mostly less than 8 cm. tall, often sprawling; leafy bracts of inflorescence rarely white-margined; inflorescence either terminal or extending well down the stems ..... 4. *P. Kelloggii.*
Plants mostly 8–19 cm. tall, erect; bracts of inflorescence with an evident white margin; inflorescence always terminal ..... 5. *P. confertiflorum.*

Unless otherwise indicated all specimens cited below are in the Gray Herbarium.

1. POLYGONUM POLYGALOIDES Meisner, DC. Prod. **14**: 101. 1856.—Type locality: "In Clear-Water, Oregon (Spalding)." (The Rev. Spalding lived at "Lapwai on the Clearwater River a dozen miles above its mouth."[1] This is now in Nez Perce County, Idaho. Spalding's specimens collected in this general vicinity were distributed as from "Clearwater, Oregon." Probable isotype at Gray Herbarium. Range: Eastern Washington, northeastern Oregon, Idaho, and reported by Small, Mem. Dept. Bot. Columbia Coll. **1**: 136. 1895 (Monogr. N. Am. Polygonum), from Montana.

2. POLYGONUM (AVICULARIA) **esotericum** sp. nov. (FIG. 1). Annuum, glabrum, nanum; caule erecto vel declinato, 6–14 mm. longo; ochreis hyalinis, tripartitis; foliis linearibus, acutis, 8–10 mm. longis; bracteis imbricato-adpressis, 2–5 mm. longis, lanceolatis vel oblongo-lanceolatis, prominulo-1-nerviis medio circumscripte viridibus margine albido-membranaceis; inflorescentiis terminalibus, racemosis, graciliter cylindraceis, folioso-bracteatis, 2–7 cm. longis; floribus 8-andris; calyce 1.8–2.2 mm. longo, 5-partito, carinato-trigono; achaenio triquetro vel basi subtereto, faciebus anguste lanceolatis vix ovato-lanceolatis, laevissimo nitido vix reticulato-striato opaco.

Glabrous annual herb; stem erect or at first declined, 6–14 cm. long, with several erect branches from near the base; leaves linear, 8–10 mm. long, acute, falling early; leafy bracts of inflorescence ascending-appressed, 2–5 mm. long, lanceolate to oblong-lanceolate, midrib elevated on lower surface, margin white, scarious, mostly reflexed, mainly entire: ocreae membranous, scarious, sheathing, 3-parted, jointed to leaves and leafy bracts; inflorescence a terminal, slenderly cyclindric, spicate raceme 2–7 cm. long; flowers shortly pedicelled, 1–3 in the axil of each bract; fruiting calyx nearly equaling to slightly exceeding the achene, 2–3 mm. long, five-parted to below the middle, segments oblong-lanceolate, 2 outer manifestly longer than the rest even in bud, tips of the 2 outer segments folded together and united;

[1] Chas. H. Chapman, The Story of Oregon and Its People, 85. 1909.

stamens with anthers 8 (vide infra), 3 inner filaments dilated below; styles 3, short, capitate; achene 1.8–2.2 mm. long, shorter than to slightly exceeding the calyx, pale brown, shining, narrowly lanceolate in outline, and subterete below and trigonous above, to longitudinally striate-reticulate, dark brown and ovate-lanceolate in outline and

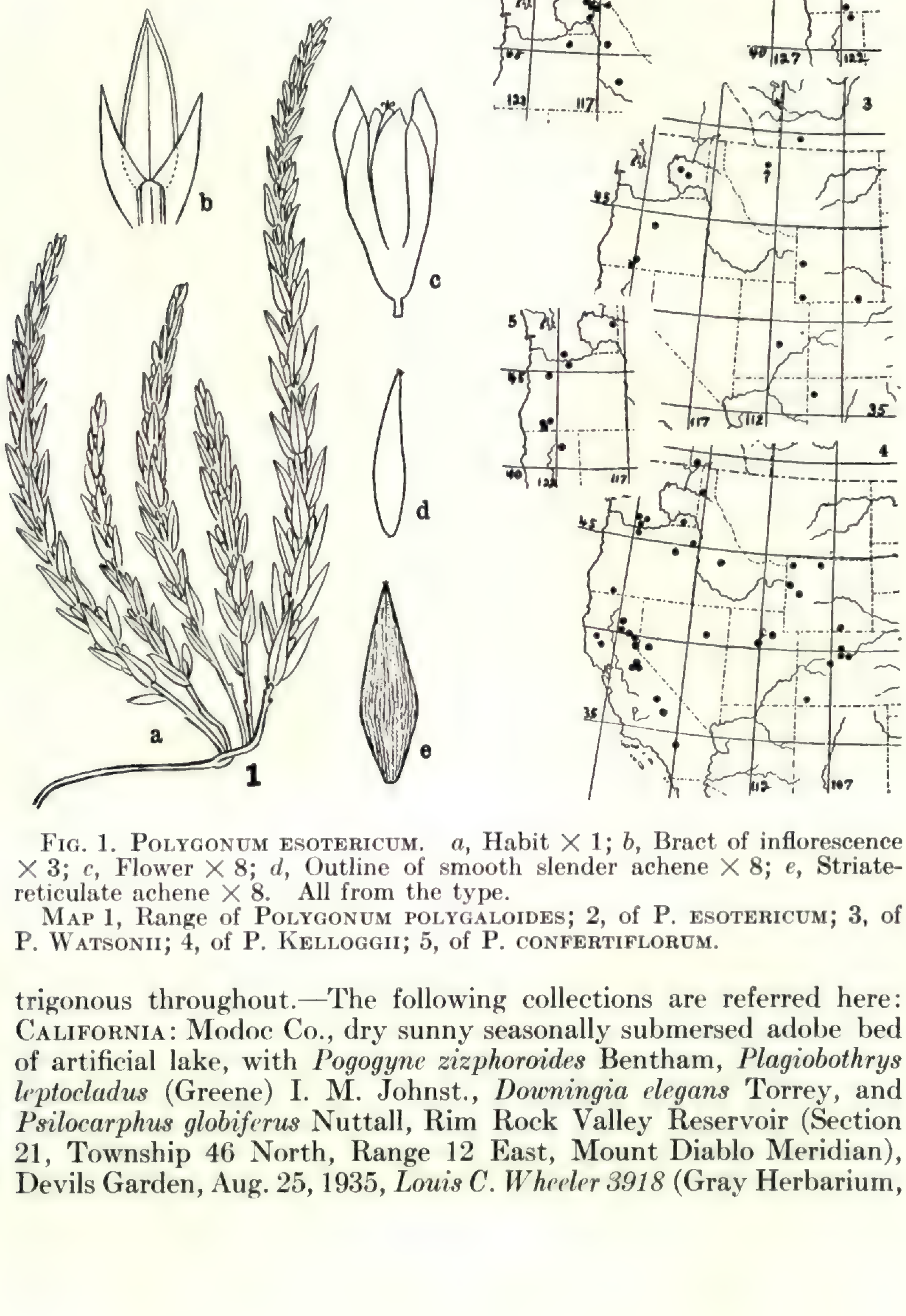


FIG. 1. POLYGONUM ESOTERICUM. *a*, Habit × 1; *b*, Bract of inflorescence × 3; *c*, Flower × 8; *d*, Outline of smooth slender achene × 8; *e*, Striate-reticulate achene × 8. All from the type.

MAP 1, Range of POLYGONUM POLYGALOIDES; 2, of P. ESOTERICUM; 3, of P. WATSONII; 4, of P. KELLOGGII; 5, of P. CONFERTIFLORUM.

trigonous throughout.—The following collections are referred here: CALIFORNIA: Modoc Co., dry sunny seasonally submersed adobe bed of artificial lake, with *Pogogyne zizphoroides* Bentham, *Plagiobothrys leptocladus* (Greene) I. M. Johnst., *Downingia elegans* Torrey, and *Psilocarphus globiferus* Nuttall, Rim Rock Valley Reservoir (Section 21, Township 46 North, Range 12 East, Mount Diablo Meridian), Devils Garden, Aug. 25, 1935, *Louis C. Wheeler 3918* (Gray Herbarium,

type; author's herb., isotype), *3919* (Gray Herb.). Oregon: Klamath Co., dry pond-basins, Swan Lake Valley, July 19, 1895, *E. I. Applegate 620.* This last collection is rather over-mature but seems to belong here. Map 1.

The two collections from California, though from the same locality, represent two slightly different elements. The two were growing intermingled though they showed a barely perceptible difference in their environmental preferences. One preferred spots an inch or two lower which would be wet later. No. 3918 has all eight stamens with fertile anthers, its inflorescence less dense, and the leafy bracts with narrower white margins; achenes narrowly to broadly lanceolate in outline and the narrowest smooth and pale brown. No. 3919 has the inner whorl of three stamens with fertile anthers but the outer whorl of five with shrivelled mostly sterile anthers, its inflorescence more dense and the leafy bracts with wider white margins; achenes lanceolate to ovate-lanceolate in outline, the narrowest smooth but chocolate-brown. The occurrence of these two entities, one obviously evolved from the other or both from a common ancestor, together and yet, so far as observed, without intermediates, is very puzzling. This would seem to cast doubt on the universal applicability of the belief, variously expressed but rather generally held, that a space-barrier of some sort is necessary for the isolation of an incipient new organic entity from its immediate ancestor. This may be a fairly valid rule for animals but in plants polyploidy or physiological factors of various sorts may create an effective barrier against formation of fertile hybrids, or may separate the flowering periods thus creating a chronological barrier.

The race of *P. esotericum* with only 3 fertile stamens can be distinguished from *P. confertiflorum* and *Kelloggii* by its very slender inflorescence and narrower achenes as well as by the rudimentary sterile anthers on the outer whorl of 5 stamens. Though the key is believed to be workable as stated, the sterile anthers in this race of *P. esotericum* are so small that they are difficult to see with a hand lens.

3. P. Watsonii Small in Mem. Dept. Bot. Columbia Coll. **1**: 138. 1896, based on *P. imbricatum* Nutt. apud. S. Wats., Amer. Nat. **7**: 665. 1873 (in King, Rep. Geol. Expl. 40th Par. **5**: 316. 1871, in synon.), not Raf., Fl. Tell. **3**: 16. 1837.[1]—Type: "R[ocky] Mts.—U.[pper] Calif.", *Nuttall* (Gray Herb.).

That the type of *P. imbricatum* (and therefore of *P. Watsonii*) probably came from outside California as now delimited is suggested by

[1] See Barnhart, Torreya **7**: 182. 1907 as to date.

the fact that no other specimens of this species purporting to have come from California have been seen. The plant illustrated by Small, idem, as *P. Watsonii* is *P. confertiflorum* Nutt. as Piper, Contr. U. S. Nat. Herb. **11**: 228. 1906 (Fl. Washington), maintained. The description at least in large part also applies to *P. confertiflorum* but neither the figure nor description of the calyx applies to either *P. confertiflorum* or *P. Watsonii* but agrees essentially with *P. Kelloggii*. Piper, idem, considered *P. Watsonii* identical with *P. Kelloggii*. He placed his faith in the character of the surface of the achene. It happens that the type of *P. Watsonii* has both smooth and reticulate achenes which may still be observed *in situ*. Piper noticed a smooth achene and assumed that all were smooth. Other specimens of *P. Watsonii* have dimorphic achenes. Surface dimorphism of *Polygonum* achenes was noted by Watson, King, Rep. Geol. Expl. 40th Parallel **5**: 316. 1871 (*sub P. coarctatum* var. *minus*) for the plants included in *P. imbricatum* Nutt. Other types of achenial dimorphism in *Polygonum* have been noted by Bicknell, Bull. Torr. Club **36**: 450. 1909 (Fl. Nantucket), and by Small, l. c., **24**: 46. 1897.

The following exsiccatae will illustrate my interpretation of the species and show its range: CANADA: Cypress Hills, Great Plains (in both Alberta and Saskatchewan, center at 110° W. long., 49° 40′ N. lat.), *J. Macoun 149*. ALBERTA: Hand Hills, *J. Macoun 190*. MONTANA: Teton Co.?, Birch Lake, *Wm. M. Canby 279*. WYOMING: Sublette Co., New Fork Lakes, *E. B.* & *L. B. Payson 4381*. Uinta Co., Jackson's Lake, *Aven* & *Elias Nelson 6556*. Albany Co., Chimney Park, *E. Nelson 656*. UTAH: Garfield Co., Aquarius Plateau, *P. A. Rydberg* & *E. C. Carlton 7476*. NEW MEXICO: San Juan Co., Tunitcha Mts., *P. C. Standley 7632*. WASHINGTON: Grant Co., Coulee City, *C. V. Piper 3901, 3902*. Adams Co., Ritzville, *J. H. Sandberg* & *J. B. Leiberg 200*. OREGON: Klamath Co., 12 mi. w. of Keno, *M. E. Peck 9308;* Pelican Bay, w. side Upper Klamath Lake, *M. E. Peck 9509*. Crook Co., Button Springs, *J. B. Leiberg 367*.

4. P. KELLOGGII Greene, Fl. Franciscana, 134. 1891.—Type: near Donner Lake, Sierra Nevada, Nevada Co., California, Dr. *A. Kellogg* in 1870. Dr. Theodor Just kindly examined the Herbarium Greeneanum at Notre Dame and reports that Greene indicated as type the above collection in his herbarium. *P. unifolium* Small in Mem. N. Y. Bot. Gard. **1**: 129. 1900 (Fl. Montana), type: Cedar Mts., Montana, *Rydberg* & *Bessey 5367* (Herb. N. Y. Bot. Gard.), this specimen marked "type" by Rydberg. *P. minutissimum* L. O. Williams, Ann. Mo. Bot. Gard. **21**: 343. 1934, may belong here. Range: British Columbia, Washington, Oregon, California, Idaho, Wyoming, Colorado, Utah, Nevada.

All references to the occurrence of *P. Watsonii* in California are in error, as far as the specimens I have examined are concerned and according to my interpretation. Most, perhaps all, such references are to plants referable to *P. Kelloggii*. Jepson, Fl. Calif. **1**: 382–3. 1914, maintained both *P. imbricatum* and *P. Watsonii*. He excluded the synonymic type upon which *P. Watsonii* was based and evidently intended to apply the uame to the supposed entity defined by Small under that name. Since Small's description applies mainly to *P. confertiflorum*, Jepson's application of Small's description is largely in error. From Jepson's description it appears that he applied *P. imbricatum* to the very race upon which Greene based *P. Kelloggii* (I am applying *P. Kelloggii* in a broader sense) and that he applied *P. Watsonii* in such a way as to include plants with 3 anther-bearing stamens (here interpreted as *P. Kelloggii*) as well as those extralimital plants with eight anther-bearing stamens (here interpreted as *P. Watsonii*) so long as they had dark-colored more or less striate achenes. *P. imbricatum* Nutt. var. *Watsonii* Small apud Jepson, Man. Flow. Pl. Calif., 290. 1923[1] is based on the same confusion and interpretation as Jepson's previous use of both names in specific rank. It would be interesting to know what Jepson took as the type of *P. Watsonii* Small. Incidentally it is only by taxonomic inference and similarity of the name that the var. *Watsonii* is assumed to be based on the species *Watsonii* for no name-bringing synonym is cited and there is no indication that the variety was new.

Polygonum Kelloggii Greene, as here defined, is an aggregate of numerous apparently hopelessly intergrading races. The particular race which Greene described is perhaps best represented in the extreme by *Smiley 690* cited below. *A. A. Heller 6929*, "From type locality," Donner Lake, Sierra Nevada, Nevada Co., California, has some dark brown, conspicuously reticulate achenes in some plants. All the plants have the leafy bracts pointing upward, rather than spreading as in *Smiley 690*. The habit of the bracts in *Heller 6929* combined with the dark achenes makes this collection intermediate between what Greene, l. c., 135, called *P. imbricatum* and his new species *P. Kelloggii*. Some few collections contain plants that are taller than the measurements given in the key. The two following collections are, on the average, taller than 8 cm. and one plant is 12 cm. tall: Califor-

[1] Title-page date questionable but here accepted for convenience as no conflict as to priority is involved.

NIA: Yosemite National Park, near Dark Hole, Tioga Road, altitude 7,600 ft., *F. J. Smiley 883;* Yosemite Valley, altitude 4,000–4,500 ft., *L. R. Abrams 4502.* These two, with the third collection cited below, represent a local race of *P. Kelloggii* characterized by short, broad, pale, reticulate achenes; generally greater height; and compact inflorescence: Cathedral trail to Mt. Tallac, alt. 6,700 ft., Sierra Nevada, California, *F. J. Smiley 209.* This race is distinguished readily from *P. confertiflorum* by the absence of white margins on the bracts and by the pale short achenes. Occasional collections of *P. Kelloggii* show very narrow white margins on the bracts: OREGON: Dead Indian Valley, summit of Cascade Mts., *W. C. Cusick 2953;* CALIFORNIA: Round Valley, Mendocino Co., *J. W. Blankinship*, June 8, 1873, *s. n.* This last closely approaches *P. confertiflorum.* Plants of very distinctive appearance are those from Lake Tenaya, Yosemite National Park, California, *F. J. Smiley 690.* Though heavily fruiting these plants have entirely simple stems not over 2 cm. high. But *A. Eastwood 487* from the same place has the more usual habit of *P. Kelloggii* and smooth pale achenes which match those of *Smiley 690.* This race with smooth, short, pale achenes seems to be confined to the Sierra Nevada, California. *P. unifolium* Small represents another apparent race with elongated lower internodes and very short terminal inflorescence. Whether this habit is hereditary or due to crowding by other low herbs is difficult to decide. The presence of both the usual sprawling and the erect habit in various collections, as Snake River, Uinta Co., Wyoming, *A. & E. Nelson 6463* (distributed as *P. polygaloides*), suggests that the erect habit is ecological.

It may be possible by careful study of a large series of specimens to recognize and define several minor entities from the aggregate here included in *P. Kelloggii.* Criteria which may prove useful but which must be carefully weighed, rather than assumed to be usable and arbitrarily applied, are: general habit; differentiation of leaves; aggregation of inflorescence; relative length of calyx-segments and length of the conduplicate and united tips of the longer ones; presence or absence of sterile stamens; shape, surface, and color of achenes.

5. P. CONFERTIFLORUM Nutt. apud Piper in Contr. U. S. Nat. Herb. **11**: 228. 1906 (Fl. Washington), not Dougl. apud Hooker, Fl. Bor.-Am. **2**: 132. 1838,[1] in synonymy. TYPE: "Columbia, &c. plains" [quoted from the label], *Nuttall* (Herb. Gray). *P. confertí-*

[1] See Erythea **1**: 160. 1893 as to date.

folium Nutt. apud S. Wats. in King, Rep. Geol. Expl. 40th Parallel **5**: 316. 1871, in synonymy. Based on the same specimen as Piper's similar name. Piper misread the name Nuttall had written on the label of the type. Whether the name should be "corrected" is difficult to decide. There is the unhappy possibility that *P. confertiflorum* Dougl. may have been validated before Piper's validation of Nuttall's name. However, Douglas' name does not seem to have been validated.—Range: WASHINGTON: Spokane Co., Spangle, *W. N. Suksdorf 4777.* Klickitat Co., Falcon Valley, *W. N. Suksdorf 478.* OREGON: Marion Co., Salem, *J. C. Nelson 1614.* Josephine Co., Grants Pass, *C. V. Piper 6264;* Takilma, *M. E. Peck, 8145.* Jackson Co., Fall Creek, *E. B. Copeland 3469.* Wasco Co., Mosier, *J. W. Thompson 5156.* CALIFORNIA: Shasta Co., Goose Valley, *A. Eastwood 1022.*

P. confertiflorum is usually readily distinguishable from *P. Kelloggii* by the characters in the key. Confusing plants are discussed above.

The number of anther-bearing stamens in this group of five species is either three or eight. The plants in which I find but three anther-bearing stamens have often been described as having five stamens, yet in the ninety-six odd collections in which stamens were counted the numbers were all either three or eight anther-bearing stamens except for one case in *P. confertiflorum* in which there was a fourth filament bearing a rudimentary anther in one flower. Except for this case and *Wheeler 3919*, discussed under *P. esotericum*, all anthers present were fertile. The anthers fall at a touch in dissecting mature flowers. Consequently counts are best made in unopened flowers. Perhaps counts of "five" have been made by counting filaments in mature flowers in which the anthers had fallen without consideration of whether the filaments had borne anthers. It appears that in these five species there is an inner whorl of three stamens which are always fertile and a potential outer whorl of five stamens. This outer whorl may be reduced to such an extent that it may not be manifested by any external structure, or represented by filaments of various sizes, or present as five anther-bearing stamens. It would be reasonable to suppose that there might be intermediate numbers of anther-bearing stamens but except for the one case noted none was found. In order to check the possibility that both three and eight anther-bearing stamens might occur in different flowers on the same plant two flowers were examined from one plant in about half the collections studied and no plants were found with both three and eight fertile stamens. The possibility that, while the number of anther-bearing

stamens was uniform in one plant, different plants in the same population might have different numbers was checked by two methods: (1). The anther-bearing stamens were counted in one flower in each of ten plants in one collection (Oregon, *Leiberg 240*) of *P. Kelloggii* and all had three. The same count was made in two collections (Oregon, *Leiberg 367;* New Mexico, *Standley 7632*) of *P. Watsonii* and all had eight. (2). *P. Kelloggii* is very common in California but in the collections examined there were no plants with the same general aspect but with eight fertile stamens (*P. Watsonii*) from California. Likewise *P. Kelloggii* occurs in Nevada but no collections of *P. Watsonii* were seen from that state. *P. esotericum* occurs in California and has eight anther-bearing stamens but is readily distinguishable from *P. Kelloggii* by the slenderly cylindric inflorescence, white margins of the bracts, narrower achenes, and eight anther-bearing stamens; and from *P. Watsonii* by the characters already given in the key. Consequently there is both statistical and phytogeographic evidence that, while *P. Kelloggii* and *P. Watsonii* are often indistinguishable by habit and aspect, the difference in their numbers of fertile stamens is not due to either chance or vigor of the plants.

The two following species were published without designation of the precise specimen upon which they were based or the locality given was vague:

POLYGONUM MINIMUM S. Wats. in King, Rep. Geol. Expl. 40th Parallel **5**: 315. 1871.

The TYPE, in Herb. Gray, came from Bear River Canyon, Uinta Mts., Utah, alt. 10,500 ft., Aug., 1869, *Sereno Watson 1058*.

POLYGONUM SHASTENSE Brewer in Proc. Am. Acad. **8**: 400. 1873.

In view of the specific name it seems appropriate to take *Brewer 1382* from Mt. Shasta, Siskiyou Co., California, as the type. Brewer gives the following data in his field-notebooks: "1382 Polygonum. A nearly prostrate shrub. 8000′ to 9000′ alt.—fls. rose, deepest on midvein of petal. Stam. 8—(number inconstant ?) Stig. 3-cleft." Sept. 13 (?), 1862, not 1863 as stated on printed label-heading.

VI. THALICTRUM POLYCARPUM S. WATS., A DISPUTED NAME

LOUIS C. WHEELER

There are two problems involved in this name: (1) What is the type? (2) Is the name available?

(1) *Thalictrum polycarpum* was published by Sereno Watson, Proc. Am. Acad. **14**: 288. 1879, in an article entitled: Descriptions of some new Species of North American Plants. In synonymy were cited: ". . . T. Fendleri, var. (?) polycarpum, Torr. in Pacif. R. Rep. 4. 61, in part. T. Fendleri, Brew. & Wats. Bot. Calif. 1.4, mainly." Watson's next reference to his species is Bot. Calif. **2**: 424. 1880, where he cites only the first synonym given above, again "in part." In the Synop. Fl. N. Am. **1**(**1**): 16. 1895, only the originally cited synonyms are given. In view of the fact that in no case did Watson state definitely on what part of *T. Fendleri* var. ? *polycarpum* his *T. polycarpum* was based and since he gave no indication of how he disposed of the remainder of the synonym, the species must, nomenclatorially, stand as Watson's solely rather than (Torr.) Watson. That means that the type must be sought at the Gray Herbarium. Davis, Minn. Bot. Studies, ser. 2, pt. **4**: 509–523. 1900 (Synonymic Conspectus of the Native and Garden Thalictrums of North America), does not consider the matter of types. The publication (by Torrey) in Pac. RR. Rep. **4**(**5**): 61. 1857, is as follows:

"Thalictrum Fendleri, Engelm. in Gray, Pl. Fendl. p. 5; var. ? polycarpum: glaberrimum; carpellis numerosioribus eglandulosis. Mountain ravines, New Mexico. In fruit October, &c. Sides of rivulets, Napa valley, California, April 25, (with immature fruit). It occurs in Coulter's California collection, in flower only . . ."

In Plantae Fendlerianae neither locality nor collection is cited for *Thalictrum Fendleri*. An examination of the specimens of *T. Fendleri* at the Gray Herbarium reveals that the species is evidently based on Fendler *no. 13* in 1847 from New Mexico. Fendler's field notes (or a copy?) at the Gray Herbarium fail to elucidate matters. Someone, in the copy of the Pac. RR. Rep. 4 at the Gray Herbarium, has indicated that the New Mexican specimens belonged to *T. Fendleri*. But the field notes state: "Santa Fe, Creek-valley, shady places, margin of irrigating ditches at the foot of perpendic. rocks. 13th June–1st July in flower, 19th July in fruit". Since these data as to the type cannot be reconciled with "Mountain ravines, New Mexico. In fruit October, &c." there is no proof that there was any mistake made by Torrey, idem.

Watson applied *T. polycarpum* to a Californian entity and subsequent authors have followed him. The least confusion will be caused if the type chosen for *T. polycarpum* Wats. is the Napa Valley collection of Bigelow cited by Torrey under *T. Fendleri* var. ? *polycarpum*.

There is a specimen of this collection at the Gray Herbarium and I consider this the type of *T. polycarpum* Wats. An attempt was made to determine whether Torrey ever intended to apply the name *T. Fendleri* var. ? *polycarpum* to any New Mexican specimens. The folders of *T. Fendleri* and *polycarpum* at the New York Botanical Garden, where Torrey's herbarium is now kept, were examined. No specimens from New Mexico were labeled *T. Fendleri* var. ? *polycarpum*. But for that matter the Bigelow specimen from Napa Valley in 1853–4 was named only *T. Fendleri* Engelm. The Coulter specimen mentioned above was not found at New York. At the Gray Herbarium a sheet of the Bigelow collection is labeled *T. Fendleri* var. ? *polycarpum*. Also there is a staminate specimen collected by Coulter in California without date or number. This was originally labeled *T. Fendleri* but a later hand added *T. polycarpum*. It appears that Torrey may have sent his specimens to Asa Gray. Perhaps the Bigelow specimen at the Gray Herbarium should be considered the type of both *T. Fendleri* var. ? *polycarpum* Torrey and *T. polycarpum* Wats.

(2) Greene, Muhlenbergia **5**: 128. 1909: "It is also now apparent that the name T. polycarpum is untenable. It had been chosen to designate an Old World member of the genus twenty years before Mr. Watson attempted to employ it. Since, then, the Watsonian type must be named anew, I shall take this occasion to give it a fuller description." The earlier *T. polycarpum* referred to by Greene was published by Loret, Bull. Soc. Bot. Fr. **6**: 17. 1859, after describing the puzzling plant he was considering, in these words: "S'il m'était réservé de lui imposer un nom, je lui donnerais volontiers celui de *Th. polycarpum* ou mieux *multiflorum* . . ." Hence this is an illegitimate name of the type known as a *nomen provisorium*. Provisional names[1] are not only illegitimate but are not validly published.[1] Since they are not validly published they cannot, as earlier homonyms, invalidate a later name.[2] Lecoyer, Bull. Soc. Bot. Belg. **24**: 78–324. 1885 (Monogr. Thalictrum), cites, p. 304, *T. polycarpum* Loret in synonymy and gives no adoption of the name by any other author. Hence *T. polycarpum* S. Watson is a valid name.

Greene, l. c., 129, published *T. ametrum* as a new name for *T. polycarpum* S. Watson. Jepson, Flora Calif. **1**: 530. 1922, states, after

[1] See Zesde Internat. Bot. Proc. **1**: 365. 1936; Sprague, Jour. Bot. **74**: 75. 1936; & Internat. Bot. Cong. 1930 Nomenclature Prop. Brit. Bot., 16–17, Art. 44. 1926, for discussion and examples.

[2] Internat. Rules Bot. Nomencl. ed. 3, Art. 61. 1935.

citing *T. ametrum* in synonymy, "type loc. seaward Coast Range." Evidently this was done under the misapprehension that *T. ametrum* was a new species rather than a new name.

VII. THE TYPE OF THE GENUS LEPIDOSPARTUM

Louis C. Wheeler

The type species of *Lepidospartum* A. Gray is *Lynosyris squamata* A. Gray since, when the genus *Lepidospartum* was described, this was the only species assigned to it. So far there is no problem. What specimen should be taken as the type of the species is, however, something of a puzzle. Gray had only two specimens at the time he described it. This is evidenced by the fact that there are in the Gray Herbarium only two sheets bearing respectively the names *Lysosyris squamata* var. *Breweri* and *L. s.* var. *Palmeri;* all other sheets bear collection dates later than 1870, the year in which Gray described the two above varieties. To have designated two varieties from only two specimens leaves nothing as the type of the species according to our present ideas of proper typification. Gray himself seems to have given no hint of which element he considered the more typical. In no case that I can find did he reduce one variety to synonymy and maintain the other. In Syn. Fl. N. Am. **1**(**1**): 378. 1884, he abandoned both varieties simultaneously, concluding that they "are mere varying forms." Abrams, Bull. N. Y. Bot. Gard. **6**: 482. 1910 (Phyteographic & Taxonomic Study S. Calif. Trees & Shrubs), concludes that "We are therefore obliged to consider the Brewer plant as the type of the species, reducing the varietal name to synonymy." Evidently Abrams made his choice arbitrarily by priority of position as required by the now passé American Code. The International Rules provide that in the case of simultaneously published synonymous names, the author who first reduces one to a synonym of the other thereby determines which shall be used. This case of reduction by Abrams is unfortunately not quite parallel since he, idem, in his next sentence, reduced var. *Palmeri:* "The desert form, *Palmeri* does not seem distinct." It seems expedient to apply the unqualified specific name to the widespread entity. Therefore the Brewer specimen which represents this is taken as the type of the species *squamatum* which is the type of the genus *Lepidospartum*.

It is usual in modern monographic studies to designate by "var.

typica," or some similar non-transferable epithet, the typical variety (or other category ranking lower than specific) if one or more others are to be recognized. Here such a course is not open. The earliest varietal name for this entity is *Breweri* which is based on the type of the species *squamatum*. It is unfortunate that the Rules do not require either that "typica" be used to designate the typical entity or, perhaps better, that the specific epithet be repeated. The 1935 Rules, by inference from Recommendation 18, allow the use of any name to designate the typical entity in categories below specific rank. An absolute defect of the Rules is the unqualified requirement that the earliest available name as of that rank be used, This requires the use of many names designating the typical in lower-than-specific categories which are based on a type other than that of the species and which were intended to be different. Evidently this provision remains because of failure to correlate the type concept with the rules as to priority. The two are occasionally antagonistic. The priority rule should be modified to require the use of a name based on the same type as the species for any taxonomically identical subdivision of that species. Since this is not a monographic treatment and since a transfer might result in further nomenclatorial confusion I shall refrain from transferring the varietal epithet *Breweri* which is based on the type of the species.

The following key summarizes the differences between typical *Lepidospartum squamatum* and its var. *Palmeri:*

Phyllaries mostly extending little onto the peduncles and stopping abruptly without grading into the scaly leaves; scaly leaves discrete on fertile stems.....*Lepidospartum squamatum.*
Phyllaries extending well down (5–8 mm.) the peduncles and grading into the scaly leaves; scaly leaves crowded on fertile stems.....*L. s.* var. *Palmeri.*

LEPIDOSPARTUM SQUAMATUM (A. Gray) A. Gray in Proc. Am. Acad. **19**: 50. 1883, based on *Lynosyris squamata* A. Gray, l. c., **8**: 290. 1870, no type designated, see above. *Carphephorus junceus* Bentham *sensu* Durand & Hilgard in Pacif. Rail. Rep. **5**(**3**): 8. 1855. *Lynosyris squamata* A. Gray var. *Breweri* A. Gray, Proc. Am. Acad. **8**: 290. 1870, TYPE: Low Hills of the Sierra Santa Monica, Los Angeles Co., California, *W. H. Brewer 71* (Gray Herb.). *Tetradymia squamata* (A. Gray) A. Gray, l. c., **9**: 207. 1874, *T. squamata* var. *Breweri* (A. Gray) A. Gray, Bot. Calif. 1: 408. 1876. *Baccharis sarothroides* A. Gray, var. *pluricephala* Jepson, Man. Fl. Pl. Calif., 1059. 1925;[1] type: Conchilla Mts., Piñon Well, Jepson 6008 (Herb. Jepson), not seen.

[1] Date on title-page questionable but here accepted for convenience as no conflict as to priority is involved.

Munz, Man. So. Calif. Bot., 576. 1935, included the last name, on Dr. S. F. Blake's advice, as a synonym. As I have not seen the type the name is included here in deference to Blake's judgment. Gray long ago commented on the strong resemblance between *Lepidospartum squamatum* and the sergilloid species of *Baccharis* which resemblance may explain Jepson's variety.

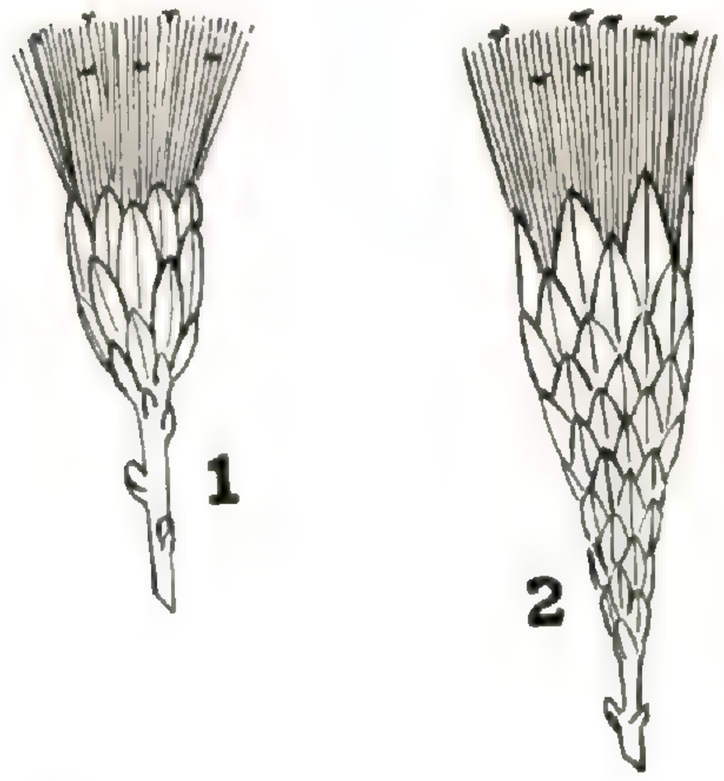


FIG. 1. LEPIDOSPARTUM SQUAMATUM, head × 2. Drawn from *Duran 3367*, California (Herb. Gray). FIG. 2. Var. PALMERI, head × 2, boiled in water to show phyllaries in natural position. Drawn from the type.

According to Brewer's field-notes preserved at the Gray Herbarium his number 71 was collected Dec. 21, 1860, in "Sierra Santa Monica from camp 3 near the sea. 71. Composite shrub common everywhere on the low hills, but more so in the cañons, generally entirely out of flower." According to W. H. Brewer's itinerary given by F. P. Farquhar, Up and Down in Santa Monica Canyon (1.5 miles from sea beach). This elucidates the type locality.

Calif., 571. 1930, camp 3 was

Typical *Lepidospartum squamatum* has been reported from: CALIFORNIA: southern Monterey Co.,[1] Tulare Co.,[2] Kern Co.,[1] Mohave & Colorado Deserts;[1] San Luis Obispo Co. to Lower Calif. and east to Arizona;[2] and Nevada.[3]

LEPIDOSPARTUM SQUAMATUM (A. Gray) A. Gray var. **Palmeri** (A. Gray) comb. nov. *Lynosyris squamata* var. *Palmeri* A. Gray in Proc. Am. Acad. **8**: 290. 1870, TYPE: "Desert of the Colorado, Arizona," *Dr. E. Palmer* in 1870 (Gray Herb.).[4] *Tetradymia squamata* var. *Palmeri* A. Gray, Bot. Calif. **1**: 408. 1876, proposed without direct reference to *Lynosyris squamata* var. *Palmeri* A. Gray but obviously identical. *Lepidospartum squamatum* var. *obtectum* Jepson, Man. Fl. Pl. Calif., 1159. 1925, type: Whitewater Wash, Riverside Co., Calif., *Schellenger*, (Herb. Jepson), not seen. Proposed without considering *Lepidospartum squamatum* var. *Palmeri*. Specimens seen: CALIFOR-

[1] Jepson, Man. Fl. Pl. Calif., 1159. 1925.

[2] Hall, Univ. Calif. Pub. Bot. **3**: 222. 1907 (Comp. S. Calif.).

[3] Blake in Tidestrom, Contr. U. S. Nat. Herb. **25**: 605. 1925.

[4] The Colorado Desert is in California, not Arizona. It appears probable that the type was actually collected near Whitewater, Riverside Co., Calif., for the variety is local in that region and, according to the itinerary kindly supplied by Dr. Blake, Palmer traversed the Whitewater area in 1870 on his way from Arizona to Los Angeles, California.

NIA: Riverside Co.: Desert Wash, Whitewater Wash, 3 miles southeast of Palm Springs Station, Dec. 21, 1935, *L. S. Rose 35678* in part (Herb. Calif. Acad.) (The other part of this number is the typical variety. I believe that the two parts were taken from different plants. If they were not it would seem to invalidate the var. *Palmeri*). Morongo Creek, Riverside Co., alt. ca. 2,000 ft., Jan. 31, 1931, *Wheeler s. n.* (Herb. Wheeler). An intergrade between the species and var. *Palmeri* is: Sandy bed of wash in lower part of Morongo Canyon, n. Colorado Desert, alt. ca. 2,000 ft., Riverside Co., Aug. 1, 1927, *J. T. Howell 2905* (Herb. Calif. Acad.).

Variety *Palmeri* occupies a very restricted area in the northwest end of the arm of the Colorado Desert known as Coachella Valley and northward for several miles in the washes which drain into it.

There is another variant of *Lepidospartum squamatum*. Typically the mature stems of this species bear only reduced scaly leaves. Vigorous young shoots bear white-woolly fleshy leaves 1–2 cm. long. In Santa Anita Wash at Arcadia, and toward the east end of New York Ave., Altadena (both in Los Angeles Co., Calif.), the prevailing condition is for much of this usually juvenile foliage to be borne on mature branches. But the flowering branches on these generally have the ordinary scaly leaves. This race with persistent juvenile foliage is at least worth comment even if not nomenclatorial recognition.

(*To be continued*)

TAYLOR'S MARINE ALGAE.—Students whose only general reference work on the marine algae has hitherto been Farlow's now almost obsolete *Marine Algae of New England* (1891) will welcome this manual[1] of the Chlorophyceae, Phaeophyceae, and Rhodophyceae recently published. The range covered extends from Hudson Bay to Virginia, but the book will probably be of greatest use in the Maritime Provinces, New England, New York, and New Jersey, where collecting has been most extensive. In the Introduction, methods of collecting and preserving algae (such as might well be practised more generally by collectors in the freshwater as well as marine flora) receive detailed treatment. Ecology and geographic distribution of species are discussed in a brief but enlightening manner. The author has outlined the history of marine phycology in the region and has given hints as to the location of herbaria of early workers. In the manual proper we find keys to classes, orders, families, genera, and species. Each group is characterized as illustrated by American material; recent discoveries in morphology and life histories are included. Dr. Jao's drawings are sure to excite the reader's admiration. All of the commoner species, and many of the less common ones, are represented in the plates. In general, references to original descriptions are omitted; but previous reports and figures are cited, and the student is instructed that he

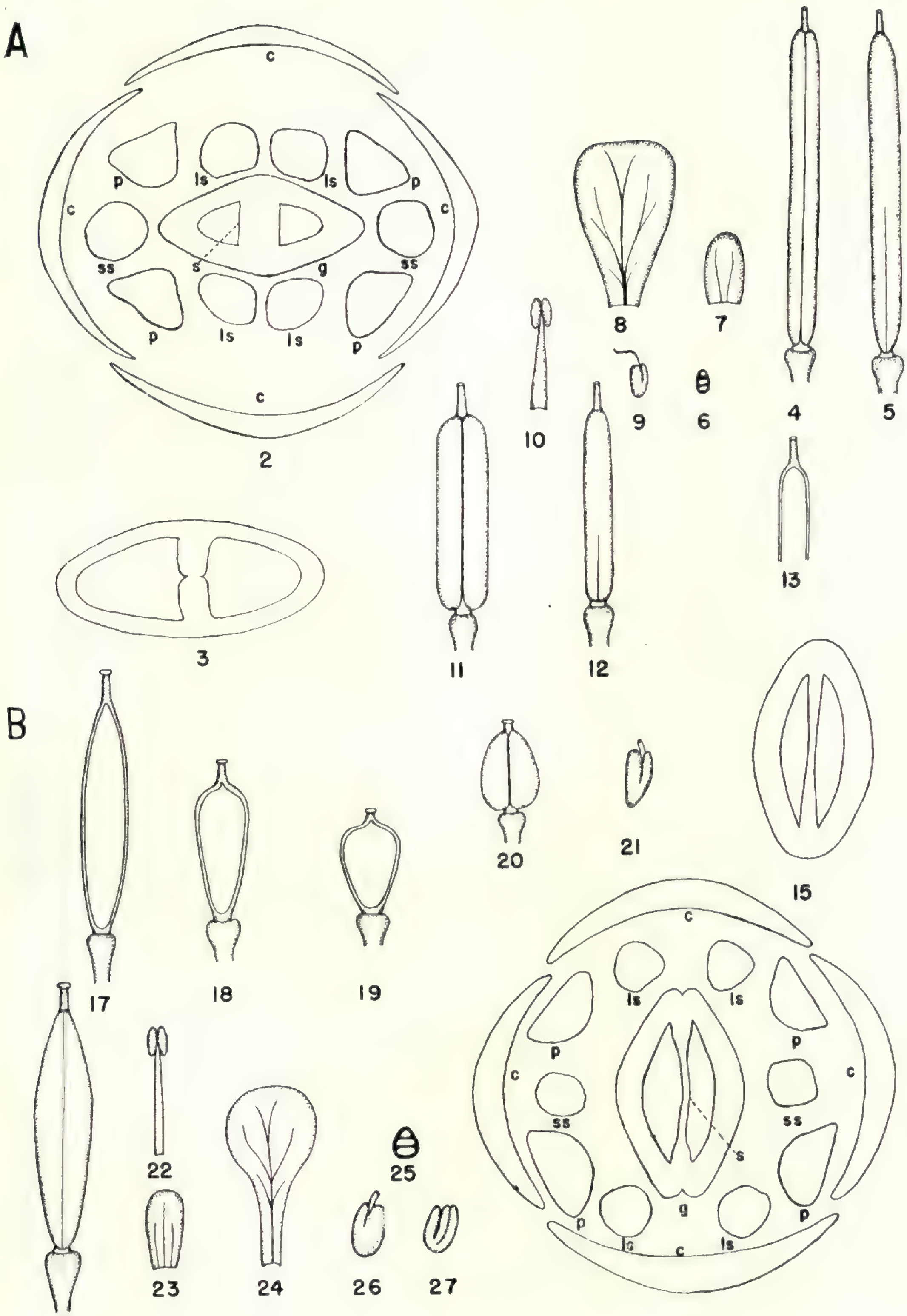
[1] Taylor, W. R. 1937. *Marine Algae of the Northeastern Coast of North America.* Illustrated by Chin-Chih Jao. Pp. i–x + 1–430. Pl. 1–60. University of Michigan Press, Ann Arbor.

will find omitted references in DeToni's *Sylloge Algarum*. We hope (and the author himself has made this wish evident in the text) that such a procedure will not cause the student to place more dependence upon this volume than upon original publications and herbarium material. Numerous changes in nomenclature have been introduced, based upon the author's recent studies in European and American herbaria and summarized in Papers Mich. Acad. Sci. **22:** 225–233 (1937). A considerable bibliography and an index are appended. Attractively printed and written in a very readable but concise and informative manner, the book recommends itself also because it reflects the author's many years of experience with his species both in the herbarium and in the field. It embraces the accounts of previous workers and the unpublished manuscript list of the late F. S. Collins. One finds, however, little of the unchallenged inclusion of earlier reports which has detracted so greatly from the usefulness of several modern treatments of the algae. A monograph on the subject would, of course, require a lifetime of constant labor. But this book may well serve as a basis for future careful work in taxonomy and related studies among the marine algae of northeastern North America.—Francis Drouet, Osborn Botanical Laboratory, Yale University.

Dormancy of Seeds.—A neat little pamphlet by Cecil Billington[1] gives the result of his study of the vegetation of the dry bottom of an artificial lake in Michigan. From his observations "it appears that tremendous numbers of mesophytic plant seeds find their way into our streams and lakes where many of them, becoming embedded in the silt at the bottom, remain dormant and viable for an indetermined number of years. The demonstrated maximum period in this case is approximately twenty-five years, but there seems to be no reason why the seeds should not remain viable a much longer time."—M. L. F.

[1] *The Vegetation of Cranbrook Lake Bottom.* By Cecil Billington. 24 pp., 1 pl., 1 map. Cranbrook Institute of Science, Bloomfield Hills, Michigan. March, 1938. 20c.

Volume 40, no. 475, including pages 249–280, was issued 7 July, 1938.



Floral and Fruiting Characters of (A) Polyctenium and of (B) Smelowskia.

SEP 9 1938

RHODORA

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. September, 1938. No. 477.

CONTENTS:

Carex foenea, C. straminea and C. albicans in Willdenow's Herbarium. *H. K. Svenson* 325

New Species, Varieties and Transfers. *M. L. Fernald* 331

Cyperus oxylepis in the United States and Mexico. *Hugh O'Neill* 358

New Variety of Polygonum from Washington. *George Neville Jones* 359

Moss Flora of North America (Review). *G. E. Nichols* 359

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

Harv. 01-507

Photo. H. G. Fernald.

PANICUM RECOGNITUM: FIG. 1, TYPE, × ½; FIG. 2, base of cauline leaf, × 1; FIG. 3, pubescence of sheath, × 10; FIG. 4, node, × 10; FIG. 5, pulvinus and base of panicle-branch, × 10; FIG. 6, spikelets, × 10.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **September, 1938.** **No. 477.**

CAREX FOENEA, C. STRAMINEA AND C. ALBICANS IN WILLDENOW'S HERBARIUM

H. K. Svenson

The exact identity of these three American species of *Carex* has always been somewhat confusing, and the temptation to examine the actual types could not be resisted when, through the kindness of Dr. Diels and Dr. Pilger, it was my privilege during the past summer to examine the Cyperaceae in the Willdenow Herbarium at the Royal Botanic Garden in Berlin. Since the results of this examination contradict the generally accepted interpretations of these species, I am providing somewhat detailed notes on the specimens.

Carex foenea Willd. It is obvious that Willdenow's brief diagnosis was based on the single sheet (no. 17167) in the Willdenow Herbarium. Unfortunately the type collection is without rootstocks, but each of the three fruiting culms bears 3 to 5 leaves which are 3 mm. wide, and has an inflorescence (approximately 2 cm. long) composed of aggregated spikes. The acute hyaline scales with greenish midrib are equalled by the perigynia. The perigynia are mature and measure 5 mm. long by 1.5 mm. wide, with the outer face showing four prominent nerves over the distended achene and similar nervation on the inner face, the most striking feature being the long smooth to slightly-serrulate beak, which rises abruptly from the narrowly winged body of the perigynium. Therefore, the type of *C. foenea* is not the plant with moniliform inflorescence with which the name has been associated, but the species long known as *C. siccata* Dewey. The only other possible disposal of this material, grown at an early date at the Berlin Botanic Garden, would be to treat it as a short-

headed and aberrant *C. bromoides*, an interpretation which under the circumstances would not be plausible.

It may be noted that Dewey's diagnosis of *C. siccata*,[1] a plant originally described from Westfield, Massachusetts, is closely similar to that of *C. foenea*, and both are included here for comparison.

C. SICCATA Dewey. "Spica composita, distigmatica; spicula terminali androgyna, superne staminifera obtusa; spiculis inferis subquaternis staminiferis ovatis acutiusculis, infime saepa inferne fructifera cum bractea squamosa oblongo-lanceolata, omnibus ovatis acutiusculis approximatis; fructibus ovato-lanceolatis acuminatis compressis margine scabris bifidis nervosis, squamam ovato-lanceolatam subaequantibus.

CAREX FOENEA Willd.[2] "C. spica androgyna composita, spiculis subquaternis, inferne masculis, approximatis, fructibus ovatis acuminatis marginatis bidentatis, squamam oblongo-lanceolatam subaequantibus. *Habitat in* America *boreali*. Carici stramineae et festucaceae proxima."

Dewey recognized the exceedingly close relationship of *C. siccata* to *C. intermedia* Good. (*C. disticha* Hudson) of northern Europe; his illustration (l. c., t. F. fig. 18) was poor and misleading, which he himself probably realized in admitting that "The figure of our plant does not show the usual number of spikelets." But how could the identity of *Carex foenea* have remained so in obscurity? *Carex* in eastern America has been studied from early times by botanists of experience and judgment—Schweinitz, Dewey, Torrey, Tuckerman, Boott—not to mention those of the present day. In the beginning, Willdenow (1809) described aberrant, soft, short-headed specimens from cultivated material, lacking entirely the characteristic rootstocks. He allied his new species (*C. foenea*) with *Carex straminea* and *C. festucacea*, probably without clear impression of the identity, to say the least, of *C. straminea* (see discussion under that species). Willdenow's correspondent, Muhlenberg, also had specimens of "*C. foenea*" and upon those Torrey and Schweinitz[3] based their conception of *Carex foenea*, and described the species as follows:

"CAREX FOENEA, Muhlenberg. C. spiculis pluribus (8–10,) compositis, inferioribus distinctis, superioribus confluentibus; fructibus ovatis, acuminatis, alatis, bidentatis, glumis ovatis paulo longioribus. Obs. This species is nearly related to *C. lagopodioides* [*C. tribuloides* Wahl.]."

Continuing this interpretation, Torrey[4] treated *C. foenea* as a marsh plant with subglobose spikelets, and to him it represented the coastal

[1] Am. Jour. Sc. x. 278 (1826).
[2] Enum. Pl. 957 (1809).
[3] Ann. Lyc. N. Y. i. 315 (1825).
[4] Compend. Fl. Northern & Middle States, 338 (1826).

plain species until recently known as *C. albolutescens* Schweinitz. It is true that Torrey did actually seek out the identity of Willdenow's specimen, but he got from Schlechtendal[1] only the worse than useless notation: "*C. foenea* n. 17,167.—Specimina hortensia Tuis flaccidior sed nullo alio modo diversa." [The garden specimens are softer than yours but in no other way different].

The unknown character of *Carex straminea* now intruded into the foreground, with Torrey, as well as other botanists of his period, trying to reconcile Schkuhr's two diverse figures of that species. Torrey, in his monograph of North American Cyperaceae,[2] believing with reason that *C. foenea* was a member of the *Ovales*, forthwith placed it as a variety under *C. straminea* and there it remained. Even Kunth, the outstanding master of the Cyperaceae, followed Willdenow, Torrey and Dewey in placing *C. foenea* in the *Ovales*, and thought it only a garden form of *C. scoparia*.[3] But Kunth did provide an excellent description of the type specimen, which might well have been given closer attention by subsequent botanists. The complete state of confusion in this group of *Carex* was well recognized by Tuckerman[4] who, including *C. foenea* and several species of *Ovales* under *C. straminea*, noted that if *Carex foenea* was a poor species, *Carex festucacea* appeared to be even worse.

The question naturally arises as to why Willdenow allied *C. foenea* with the *Ovales*. The answer, I believe, is that the position of staminate flowers in *C. foenea* (*C. siccata* Dewey) is extremely variable. The middle staminate spikes of the densely aggregated inflorescence could easily be taken for bases of androgynous spikes and I have, moreover, found pistillate spikes in *C. siccata* bearing a few stamens at the base. Willedenow's somewhat aberrant specimens of *C. foenea* were very mature, a situation which would not help any decision as to the actual location of stamens.

At a time when *C. foenea* was being treated as a member of the *Ovales* by all competent American botanists, L. H. Bailey examined the type in the Willdenow Herbarium[5] and identified *C. foenea* with Tuckerman's *C. argyrantha*, described by Dewey in 1860. DeCandolle states in his "Phytographie" (p. 18) that some of Schkuhr's

[1] Linnaea, x. 261 (1836).
[2] Ann. Lyc. N. Y. iii. 395 (1836).
[3] Enum. Pl. ii. 398 (1837).
[4] Enum. Caricum, 18 (1843).
[5] Mem. Torr. Bot. Club. i. 3 (1889).

Carices are at Halle. However, the herbarium at Halle was examined by Bailey (l. c.), who makes the following illuminating comment on Willdenow's collection at Berlin: "This herbarium contains most of the types of Muhlenberg and Schkuhr. The specimens were probably furnished entirely by Muhlenberg to Willdenow, and by Willdenow lent to Schkuhr. It appears from comparisons of Willdenow's specimens with Schkuhr's plates, that most if not all of the specimens from which the drawings were made, were returned to Willdenow. Duplicates were retained by Schkuhr." And further (p. 26): "The species [*C. foenea*] as I have drawn it, includes larger forms than those described either by Willdenow or Tuckerman. Willdenow's specimens, particularly, are weak and short-headed, but as they were from cultivated plants they cannot be regarded as wholly representative of the species. The specimens of *C. foenea* in Willdenow's herbarium are immature, but the characters are evident. Moreover, among the specimens of *C. ovalis*, in Willdenow's collection, is a sheet of the same, the specimens being more developed. This sheet is evidently from the same plant as the original; in fact, in the general herbarium at Berlin this plant is again mixed with '*C. ovalis*', and as *C. ovalis* was cultivated in the gardens at that time (*vide* Enum. Pl. Hort. Berol.), it is apparent that the original *C. foenea* was mixed with it in culture. It is evident, therefore, that the specimens lying with *C. ovalis*, both in Willdenow's herbarium and in the general collection, are duplicates of the type. These duplicates are important, for they are mostly mature, although they differ in no other respect from Willdenow's type specimens." It is thus easy to see how Willdenow's no. 17167, supposed to be an immature cultivated specimen of a species belonging to the *Ovales*, could be readily passed over for the selection of a more satisfactory type.

Carex siccata Dewey (and of recent authors) must now be treated as a synonym of *C. foenea* Willd. For the plant with moniliform inflorescence passing as *C. foenea* the correct name appears to be *C. argyrantha* Tuckerm. Although typified by slender plants (such as Olney's distribution from the type station at Hadley, Massachusetts), *C. argyrantha* passes to coarse plants, occasionally with compound spikes (cf. Boott, t. 381), such as are often found on newly-constructed roadbanks and in other localities where conditions are favorable for growth. This robust form, known as *C. foenea* var. *perplexa* Bailey (cf. Robinson & Fernald in Gray, Man. ed. 7, fig. 367 (1908)), has

strongly ribbed perigynia a trifle larger, but otherwise identical, with those of Olney's distribution.

CAREX STRAMINEA. Two sheets (no. 17177) are represented in Willdenow's herbarium but only the first, labeled "Klaproth" "Am. Bor.," conforms to the diagnosis on the species cover: "Carex straminea spiculis androgyneis ovatis distantibus et inferne masculis capsulis acuminatis hispidis" and to Willdenow's own description.[1] This fragmentary specimen, consisting only of the upper part of a culm, bears a flexuous inflorescence (4 cm. long) of five somewhat distant spikes, the uppermost of which is 10 mm. long, including the strongly clavate base. Those perigynia which have not fallen project beyond the subulate glistening-brown (almost coppery) scales, both perigynia and scales contributing to the echinate appearance of the inflorescence. The broadly obovate golden-brown perigynia (4.5 mm. long and 2.5 mm. wide) are strongly winged, with 10 to 12 distinct nerves on each face, and the margin of the beak is finely and irregularly toothed. These characteristics seem to delineate the plant as *Carex Richii* and nothing else.[2]

Bailey,[3] having described the perigynia of *C. straminea* as "small and comparatively narrow, often long-pointed," notes that this weak plant was the species "originally described and figured by Schkuhr." Consequently, when Fernald (RHODORA viii. 165 (1906)) saw the actual type of *C. tenera* in Dewey's herbarium, he recognized it as the small representative of *C. straminea* which had been considered as typical by Boott and presumably by Bailey, and applied the new name *Carex hormathodes* to the larger plant of the coastal marshes. From *C. hormathodes* the var. *Richii* has been segregated as a distinct species, and as such was typified by Mackenzie.[4] In Boott's illustration of *C. straminea* var. *aperta*,[5] the inflorescence to the right is exceedingly close to Willdenow's type of *C. straminea*, and so is the achene which he has illustrated in full. Schkuhr's illustration,[6] except for the stamens which were probably included on general principles, is a moderately good representation, though conventionalized and slightly reduced, of Klaproth's specimen.

[1] Sp. Pl. iv. 242 (1805).
[2] Professor Fernald concurs with me in this interpretation.
[3] Mem. Torrey Club, i. 22 (1889).
[4] N. Am. Fl. xviii. 160 (1931).
[5] Ill. Carex, t. 385 (1862).
[6] Riedgr. t. G. fig. 34 (1801).

The second sheet of *Carex straminea* in Willdenow's herbarium bears the annotation "Carex 43 Muhl. W.," and "Muhlenberg misit." It consists merely of a non-flexuous inflorescence of six greenish, nearly approximate spikes. The surface of the immature ovate perigynia (3.0 x 1.5 mm.) shows no satisfactorily definite veining, but is rather prominently reticulate. The narrow, acute, rigid scales are shorter than the perigynium, the beak of which is irregularly but strongly serrulate, with a tubular (i. e. not strongly bidentate) opening. In my opinion this specimen is *Carex normalis* Mack. (*C. mirabilis* Dewey). It has no value in fixing the type of *C. straminea*, but has contributed to the inordinate confusion which surrounds the species. Sketches of the type of *C. straminea* which I have seen at the Gray Herbarium are of this Muhlenberg specimen.

At a comparatively early date, Bailey[1] had revived the original name, *C. albolutescens* Schweinitz, for *Carex straminea* var. *foenea* Torr. Later, Mackenzie (Bull. Torrey Club, xlii. 605 (1915)), emphasizing the *obovate* character of the perigynium as described by Schkuhr, saw the "real" *Carex straminea* as a distinct plant having a strong resemblance to *C. alata*, with stiff inflorescence, perigynia 5–7-nerved ventrally, and greenish scales, and in 1922,[2] the conclusion was reached by Mackenzie that Schweinitz's type of *C. albolutescens* was the "real" *C. straminea*. Accordingly *C. albolutescens* was relegated to synonymy and the old "*C. albolutescens*" became *C. Longii* Mack. The identity of the type of *C. straminea* having now been cleared up, the name *Carex albolutescens* can happily be restored, and that of *Carex Longii*, if actually distinct from *C. albolutescens*, can be likewise maintained.

C. ALBICANS Willd. ex Sprengel.[3] The specimen was briefly described as follows: "C. spicis ♀ subternis lanceolatis erectis approximatis, fructibus lanceolatis squamam nitide albam aequantibus. *Carolina.*" The type in the Willdenow Herbarium (no. 17259) from "Carolina boreali," said by Schlechtendal (Linnaea, x. 264 (1836)) to have come from Desfontaines, is a poor juvenile specimen resembling *C. varia*, but characterized by short, narrow, and exceedingly rigid leaves. It seems impossible to determine what this wretched little plant may be, denounced by Kunth[4] with the words: "Fieri potest, ut

[1] Bull. Torrey Club, xx. 421 (1893).
[2] Bull. Torrey Club, xlix. 373 (1922) and also in N. Am. Fl. xviii. 162 (note) (1931).
[3] Syst. iii. 818 (1826).
[4] Enum. ii. 474 (1837).

species secundum talia specimina instituatur." [Is it possible that a species could be based on such specimens?]. *C. albicans*, possibly representing a very aberrant *C. nigro-marginata*, does not closely resemble any other specimen which I have seen. It is definitely not the plant now called *C. Peckii*, nor the coastal representative of *C. varia* with soft leaves and short staminate spikes, treated as *C. albicans* by Mackenzie.[1] It would seem best to drop the name entirely.

Brooklyn Botanic Garden.

CONTRIBUTION FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXII

(Concluded)

VIII. NEW SPECIES, VARIETIES AND TRANSFERS

M. L. Fernald

(Plates 497–507)

Recent studies of plants of various groups in eastern North America have necessitated the changes of some names and combinations and the description of several heretofore unrecognized spermatophytes. The illustration of many of the latter has been made possible through grants for research from the Division of Biology of Harvard University and through the photographic skill of Dr. E. C. Ogden or of my son, Henry G. Fernald.

Eragrostis trichodes (Nutt.) Nash., var. **pilifera** (Scheele), comb. nov. *E. pilifera* Scheele in Linnaea, xxii. 344 (1849).

Panicum (sub-§Scoparia) **recognitum,** sp. nov. (tab. 497, 498), planta cespitosa 0.6–1.5 m. alta; culmis firmis basi 2–3 mm. diametro, internodiis elongatis 6 vel 7, glabris; nodis plerumque glabris vel glabratis; foliis rosulatis basilaribus lanceolatis firmis glabris 3–3.5 cm. longis 5–9 mm. latis 40–54-nerviis; foliis caulinis primariis 5–7 lanceolatis firmis glabris acuminatis 0.6–1.3 dm. longis 0.8–1.5 cm. latis basi cordatis ciliatis, vaginis horizontaliter hirsutis vel glabratis pilis basi bullatis, ligulis obsoletis; paniculis primariis deinde exsertis ovoideis vel ellipsoideis 0.8–1.3 dm. longis 6–10 cm. diametro, rhachi glabro, ramibus patento-adscendentibus minute barbellatis, pulvinis pubescentibus, pedicellis elongatis barbellulatis; spiculis pubescentibus ellipsoideis basi apiceque obtusis 2.2–2.8 mm. longis 1.2 mm. latis,

[1] N. Am. Fl. xviii. 190 (1935).

gluma inferiore deltoideo-ovata acuta 0.8–1 mm. longa, superiore lemmateque sterile aequilongis valde costatis fructus lucidos subaequantibus; statu autumnali sparse ramoso, ramibus elongatis adscendentibus, paniculis terminalibus 1.5–5 cm. longis.—Southern New Jersey and southeastern Pennsylvania. NEW JERSEY: Camden County: headwaters of branch of Timber Creek, Albion, September 7, 1910, *Bayard Long*, nos. 4944, 4946, June 27, 1912, *Long*, nos. 7671 (TYPE in Gray Herb., ISOTYPE in Herb. Phil. Acad.), 7672, 7676, July 9, 1912, *Long*, nos. 7790, 7792, 7794; head of Beaver Brook, Lawnside, June 12, 1916, *Long*, no. 15,030; northwest tributary of Cooper Creek, Ashland, June 29, 1918, *Long*, no. 19,315. Ocean County: open sandy and grassy area, Waretown, July 10, 1915, *Long*, no. 13,006. Cape May County: swamp north of New England Creek, July 6, 1912, *O. H. Brown*, no. 59. PENNSYLVANIA: Kennett Square, Chester County, July 4, 1903, *W. Stone*, no. 5305; Lancaster County, July 9, 1904, *J. J. Carter*.

Panicum recognitum, for many years set apart in the herbarium of the Philadelphia Botanical Club as a strange species, was called to my attention by Mr. Long at the time we discovered *P. mundum* Fernald in RHODORA, XXXVIII. 292, t. 443, figs. 1–5 (1936). Mr. Long has sent me for study a very full series, showing the plant in all stages of development. Its relationship is apparently with *P. mundum* and with *P. scabriusculum* Ell., both of which have, in well developed plants, more numerous primary leaves, these less cordate at base and with short but definite ligules. From *P. scabriusculum*, furthermore, *P. recognitum* is at once distinguished by shorter primary leaves, elongate autumnal branches with exserted panicles, copiously barbellulate panicle-branches with hairy pulvini, obtuse pubescent spikelets, elongate 1st glume and long grain. In fact, it cannot be confused with *P. scabriusculum*, although it is likely to be traced to that species in current keys. From *P. mundum*, which has similar branching and panicles, the latter with hairy pulvini, and the blunt spikelets pubescent, it is at once separated by its more cordate leaf-blade, the widely spreading pubescence of the sheaths, the glabrous culms and mostly glabrous or glabrate nodes, the barbellulate pedicels, the more ellipsoid and longer spikelet and longer 1st glume.

Superficially *Panicum recognitum* might suggest *P. boreale* Nash, but only very superficially. The more slender and much lower *P. boreale* has fewer and glabrous-sheathed thinner leaves, panicle-branches flexuous, spikelets more obovoid and only 2–2.2 mm. long, with short 1st glume. Specimens sometimes of a single collection,

Photo. H. G. Fernald.

PANICUM RECOGNITUM: plant showing autumnal branching, × ½.

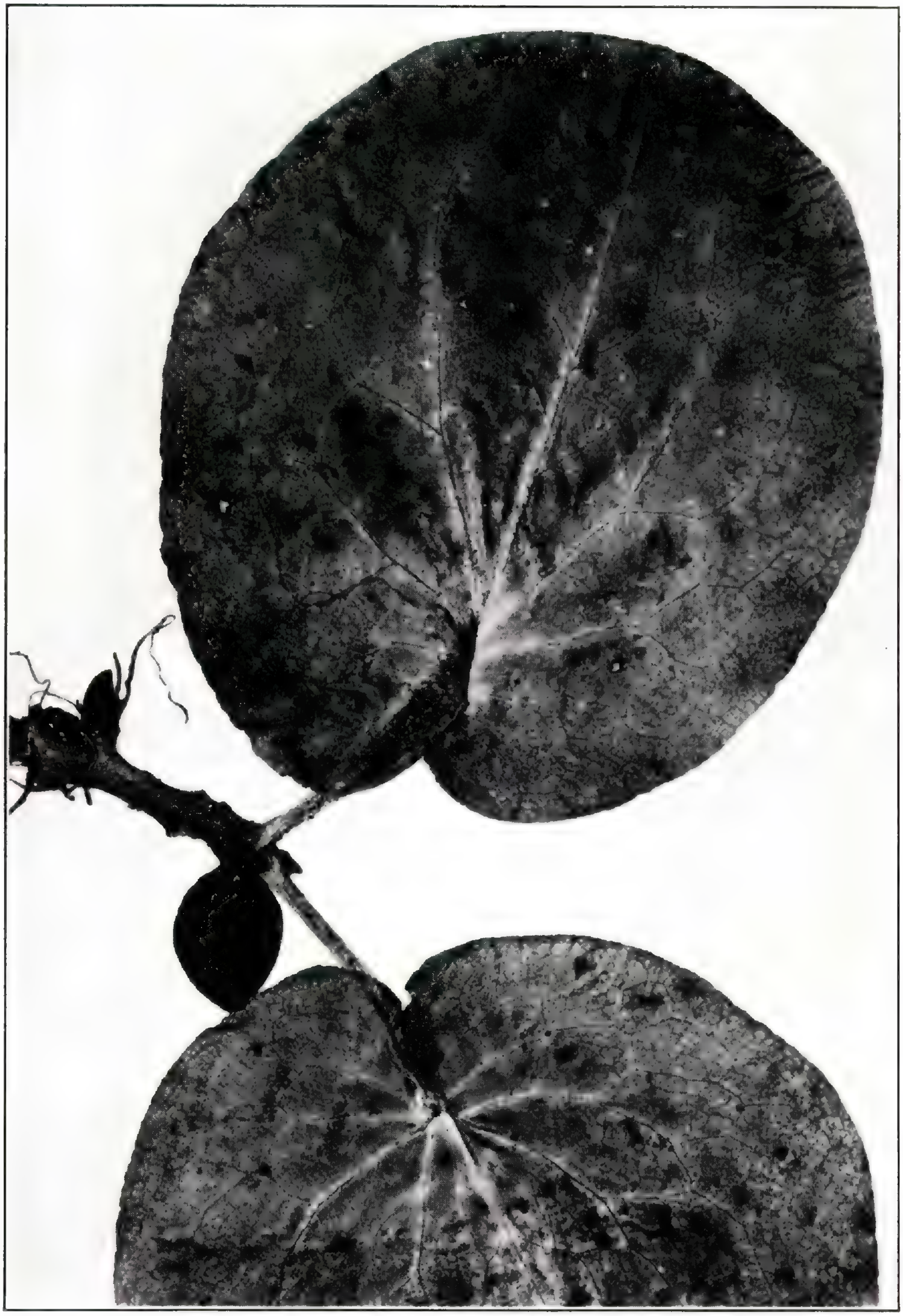


Photo. H. G. Fernald.

ASARUM CANADENSE, forma PHELPSIAE: TYPE, × 1.

have been placed by different students under such very different species as *P. sphaerocarpum*, *P. Clutei* and *P. clandestinum*, such contradictory identifications clearly indicating the difficulty met in properly placing *P. recognitum* by existing keys.

Altogether, *Panicum recognitum* seems to be another of the highly localized species of sub-§*Scoparia*, comparable in its extreme localization with *P. aculeatum* Hitchc. & Chase, *P. cryptanthum* Ashe and *P. mundum*. If it were common over southern New Jersey and adjacent Pennsylvania the acute field-botanists who are there raking every spot would have so found it.

ASARUM CANADENSE L., forma **Phelpsiae**, forma nov. (TAB. 499), foliis suborbicularibus vel rotundato-ovatis apice late rotundatis basi rotundatis sinu clauso.—NEW YORK: on limestone ledges, Gouverneur, September 4, 1915, *Orra Parker Phelps*, no. 1143 (TYPE in Gray Herb.).

Mrs. Phelps states that this remarkable plant grows with typical *A. canadense* at Gouverneur; also at a similar station in De Kalb; both in St. Lawrence County. Plate 499 shows a portion of the TYPE, × 1.

DROSERA INTERMEDIA Hayne, forma **corymbosa** (DC.), comb. nov. *D. intermedia*, β. *corymbosa* DC. Prodr. i. 318 (1824). Subvar. *corymbosa* (DC.) Rouy. Fl. de France, iv. 5 (1897).

AGRIMONIA STRIATA Michx., var. **campanulata**, var. nov. (TAB. 500, FIG. 1 et 2), foliolis ellipticis obtusis vel obtuse subacuminatis; hypanthio maturo campanulato basi rotundato 3–4 mm. longo 4–5 mm. lato, leviter costato.—Southwestern Colorado, New Mexico, Arizona and Mexico. The following are characteristic. COLORADO: moist north slope, alt. 7000 ft., Norwood Hill, San Miguel Co., August 17, 1912, *E. P. Walker*, no. 480. NEW MEXICO: Magollon Mts., Socorro Co., alt. 7500 ft., July 23, 1909, *O. B. Metcalfe*, no. 312. ARIZONA: Ramsey Canon, Huachuca Mts., September 29, 1929, *Marcus E. Jones*, no. 24,920 (TYPE in Gray Herb.); Upper Miller Canon, Huachuca Mts., August 14, 1909, *Goodding*, no. 405; Rincon Mts., September 20, 1909, alt. 7900 ft., *Blumer*, no. 3384; Barefoot Park, Chiricahua Mts., alt. 8000–8250 ft., September 9, 1907, *Blumer*, no. 1598; head of White River, White Mts., July 23, 1910, *Goodding*, no. 671. MEXICO: in the Sierra Madre, near Colonia Garcia, Chihuahua, August 28, 1899, *Townsend & Barber*, no. 290; City of Mexico, Federal District, October 9, 1898, *Holway*, no. 3235.

These specimens were mostly distributed as *Agrimonia Brittoniana* Bickn. (synonymous with *A. striata* Michx.) or as *A. Brittoniana*

occidentalis Bicknell. They were, perhaps, what the late Eugene P. Bicknell had in mind when he first applied the name *A. Brittoniana occidentalis* in the herbarium. But that name has no clear status. It was published as a *nomen nudum* for any *Agrimonia* occurring "from S. D. and Wyo. to N. M. and Ariz.," by Rydberg in his Flora of Colorado (Agr. Expt. Sta. Col. Agr. Coll., Bull. 100), 189 (1906). It had absolutely no descriptive word and the name, consequently, has no status. Even Rydberg himself, in his treatment of *Agrimonia* in the North American Flora, xxii[5]. 391–396 (1913) failed to mention it, but he mistook extreme plants of *A. striata*, var. *campanulata* for the northeastern and Californian *A. gryposepala* Wallr. He so identified Holway's material from Mexico City and he doubtless included the extreme New Mexican plants with it, giving the range for *A. gryposepala* "Nova Scotia to North Carolina, Nebraska, and North Dakota; apparently also California, New Mexico and Mexico" (l. c. 292). Except for the series from the Pacific slope (southern British Columbia to California), there is no indication in the Gray Herbarium of *A. gryposepala* from west and southwest of eastern Nebraska and Missouri.

Var. *campanulata* differs from typical transcontinental *Agrimonia striata* in its thinner and blunter leaflets (those of typical *A. striata* being usually firm, more or less canescent beneath, with long-acuminate to acute tips) and its round-based and broad fruiting hypanthium (FIG. 2); the ripe hypanthium in typical *A. striata* (FIG. 3) being cuneately turbinate, 3–4.5 mm. broad at summit and very deeply furrowed, whence the name. It occurs from Newfoundland to British Columbia and southward, in the West following the Rocky Mountains in typical form to Wyoming, with specimens clearly transitional to var. *campanulata* from as far south as New Mexico and Arizona.

POLYGALA VERTICILLATA L., var. **isocycla**, var. nov. (TAB. 501, FIG. 2 et 3), planta 0.5–2 dm. alta, plerumque ramosa, ramibus divergentibus vel oblique adscendentibus; foliis lanceolatis vel lanceolato-linearibus submembranaceis plerumque verticillatis, verticillis 3–7-foliatis; pedunculis 0.5–4 cm. longis; racemis densis lanceolato-cylindricis vel lanceolato-conicis apice attenuatis, parte florifero 0.5–1.2 cm. longo, viridiscentibus vel albidis; pedicellis 0.1–0.3 mm. longis; capsulis 1–1.6 mm. longis. *P. verticillata* sensu Pennell in Bartonia, no. 13: 9, pl. 2 (1932), not L., as to TYPE.—Dry or moist sterile open habitats, Massachusetts to southern Manitoba, south to

Florida, Alabama, Louisiana and Texas. TYPE: sandy field, Frazer, Chester Co., Pennsylvania, August 7, 1910, *E. B. Bartram*, no. 1124 (in Gray Herb.).

As noted, var. *isocycla* is the extreme of the polymorphous *Polygala verticillata* which Pennell treats as typical *P. verticillata* L. Sp. Pl. 706 (1753); whereas the plant (our FIG. 1) which Linnaeus indubitably had before him in preparing his own original *new* diagnoses in Species Plantarum, 706 (1753), which he personally marked "*verticillata*," and which in its technical details clearly matches his exact new diagnoses, is the ascending-branched and mostly taller plant with fewer and narrower leaves (3–5) in a whorl, the upper and frequently all but the lowest mostly scattered, the peduncles commonly long, the white to purplish racemes rather lax, the floriferous portion (after falling of basal fruits) 1–2 cm. long, the pedicels 0.5–2 mm. long, the seeds with slightly longer pubescence. The latter, which is the plant accurately described by Linnaeus from the material in his own herbarium, is *P. Pretzii* Pennell, l. c. 12, pl. 3, fig. 1 (1932).

Our nomenclature, most fortunately, does not reach back of 1753, and the typification of names obviously should stop there, except in those cases where Linnaeus based his species and other groups *solely* on specimens and diagnoses of earlier date. Whenever in 1753 Linnaeus had before him and clearly designated in his own herbarium a recognizable specimen and when he gave an original diagnosis which closely matches it, the references to earlier works should be treated as of minor importance if our taxonomy and nomenclature are to rest on the most secure bases possible. Otherwise, if the less clear and often quite confused writings prior to 1753 are given preference, we enter needlessly debatable and always unsatisfactory ground and taxonomy and nomenclature become unnecessarily obscure at points where they should be perfectly clear. The older diagnoses quoted by Linnaeus, as Dr. Pennell definitely shows, pertained to different entities, which he recognizes as species but which Gray, Blake (N. Am. Fl.) and most others have considered merely varieties of one variable species; and Dr. Pennell learnedly discusses the possible applications of the earlier polynomials. As studies in ancient history such speculations may be interesting but the deductions from them are needless and, as experience shows, where they are merely deductions they are exceedingly liable to error and they are too often prejudicial to the result where Linnaeus in 1753 gave a new and original account of his species

based upon actual specimens before him; only the latter is then really important. Pennell recognized that the plant in the Linnaean herbarium has some significance, saying:

"But still a further complication is introduced by the fact that by 1753 Linné had acquired for his herbarium the single specimen placed by him under this name; this came from Kalm, who collected in Pennsylvania and northward, and it was the second species of the key, named above *P. pretzii*. A plea might be made that it should be accounted the basis of *Polygala verticillata*, but against this is the fact that Kalm's plants were received so late as often to have had little influence on Linné's decisions and especially the further fact that it does not so well fit the Linnean diagnosis as does the first species of our key; the latter shows more perfectly the verticillate phyllotaxis and much better the remote disposition of the racemes."[1]

In order to be quite clear as to Pennell's interpretation it is wise to copy from his key-characters and descriptions of his *P. verticillata* (our var. *isocycla*) and his *P. Pretzii* (*P. verticillata* of L. herb.) the phrases describing the features he discusses:

1. P. VERTICILLATA sensu Pennell. Raceme slender, *dense* and conic, the sepals greenish-white; leaves all in whorls of 3–7, only the uppermost occasionally opposite or scattered; plant "1–2" (or "1–3") dm. tall, with widely spreading branches and the racemes on peduncles 0.5–4 cm. long.

[1] Pennell's argument, that "Kalm's plants were received so late as often to have had little influence on Linné's decisions," is at least novel. It is also difficult to reconcile with the well known fact, that Kalm came to America at the instigation of his teacher, Linnaeus, who, on October 23, 1747, wrote to Adalbert von Haller; "Kalm is lately gone to England, from whence he will proceed to Canada, in order to collect seeds for the Upsal garden, as the plants of that country bear our winters perfectly well. He is a pupil of mine, and has just been appointed oeconomical professor at Abo, in consequence of my recommendation"—J. E. Smith, Sel. Corr. Linnaeus, ii. 417 (1821). In August, 1748, Linnaeus again expressed keen interest in Kalm's enterprise, writing to John Mitchell, "I hope his journey will be prosperous. I have rendered him every service in my power." (Smith, l. c. 446). In the winter of 1750–51 Kalm started home to Sweden and on February 1, Cadwallader Colden wrote to Linnaeus from his estate in New York of having sent to him by Kalm some notes on American plants (Smith, l. c. 457); and Kalm himself, during his American travels, had taken every opportunity to transmit detailed accounts of his discoveries, sent "*a Monsieur Charles Linnaeus Premier Medecin du Roy et Professeur en Medicine et Botanique d'Upsal*" or "*To The Secretaire of the Swedish Royal Society of Sciences in Upsal in Sweden, Master Charles Linnaeus.*" From Kalm, returned to Sweden, Linnaeus received detailed letters, written from Stockholm and sent to Upsala, beginning in May, 1751, and continuing for some years. These letters are full of details regarding "Pennsylvanien, Nya Yersey, Nya York och Nya England" and regarding the plants which Kalm had carried back to Sweden. (See especially J. M. Hulth, Bref och Skrifoelser af och till Carl von Linné, viii.[1] 1–118 (1922), these pages being the letters from Kalm to Linnaeus). Linnaeus had Kalm's collections at least two full years before the publication of *Species Plantarum*. Those who believe that he was not profoundly interested in them and that they "had little influence on Linné's decisions" have an original and difficult thesis to defend. If Kalm's material was of so little significance, it is singular that many species were based solely upon his plants.

2. P. PRETZII Pennell (*P. verticillata* L. herb.). Raceme *looser;* the sepals white or somewhat pinkish; leaves in whorls of 3–5, the upper or sometimes nearly all scattered; plant usually 2–3 dm. tall, with ascending branches and the racemes on peduncles 2–7 cm. long.

Pennell lays much stress on the more generally verticillate leaves of his no. 1, as meaning to him that Linnaeus really intended that plant with "dense" racemes of greenish-white flowers. He also feels that the plant which Linnaeus had in his own herbarium and ticketed "*verticillata*" (Pennell's no. 2), "does not so well fit the Linnean diagnosis as does the first species of our key; the latter shows more perfectly the verticillate phyllotaxis and much better the remote disposition of the racemes."

Linnaeus had two brand new or original (unquoted) diagnoses for his *P. verticillata.* The first was taken over largely from that of his pupil, Jonas Kiernander (1751), but with most significant differences. Kiernander's diagnosis had been: "POLYGALA floribus imberbibus spicatis, caule erecto herbaceo filiformi ramoso, foliis linearibus;[1] but in his own description, in 1753 (the first diagnosis which absolutely concerns us), Linnaeus added the facts that the leaves are *verticillate,* as they are in either 1 or 2 of Pennell, and the flowers *remote* in the spike ("spicis floribus remotis", which Pennell, most unfortunately, renders "the remote disposition of the racemes"). From his mistranslation of this diagnosis Pennell deduces that Linnaeus meant the plant with racemes "dense" and "conic," not the one with them "looser." The second and wholly new diagnosis of Linnaeus read "Folia *saepius quina ad genicula, interdum alterna.* Spicae *albae, angustissimae flosculis remotis,*" which, rendered into English, would be: "leaves frequently 5 to a node, sometimes alternate; spikes white, very slender, with the flowers remote." In view of the fact that Linnaeus had, two years before the publication of this new and clear diagnosis, received the American collections of his student Kalm, who had gone to America at Linnaeus's instigation, and had placed in his own herbarium a couple of Kalm's plants which he labeled "*verticillata*" (see our FIG. 1), there should be no serious doubt that this material, accurately displaying the several points in the second and wholly new diagnosis of Linnaeus, should stand as the TYPE of his *Polygala verticillata.* The arguments that by "Folia *saepius quina ad genicula, interdum alterna*" Linnaeus intended to say "Leaves all in

[1] Kiernander in L. Amoen. Acad. ii. 139 (1751).

whorls of 3 to 7, only the uppermost occasionally opposite or scattered" and that by his "Spicae *albae*, *angustissimae flosculis remotis*" he really meant "Racemes [spikes] dense" and "conic," with "greenish-white" sepals, are unconvincing.

Polygala verticillata, var. *isocycla* (FIGS. 2 and 3) might be considered inseparable from var. *sphenostachya* Pennell in Bartonia, no. 13: 12 (1932) (our FIG. 4). Treating as *P. verticillata* (typical) the plant I am calling var. *isocycla*, with "Capsule 0.9–1.2 mm. long," his var. *sphenostachya* was defined "Floribus et fructibus majoribus diversa," which in the key on the preceding page was clarified: "Capsule about 1.5 mm. long; plants usually 1.5–3 dm. tall." A fine sheet of isotypes (*Bush*, no. 7692) of var. *sphenostachya* is in the Gray Herbarium. Its capsules are not well developed, the racemes being relatively young, but the most mature capsules, when checked by a thin and finely divided metal measure show lengths of 2–2.3 mm. (FIG. 4). Dr. S. F. Blake writes me that the TYPE in the National Herbarium likewise "has fruits measuring 2–2.3 mm. long." Similarly, a considerable series, occurring in the Mississippi Basin and adjacent areas, shows capsules of like size. These plants with large capsules (much larger than originally defined) are var. *sphenostachya*, because of the cited type. Var. *isocycla* is more wide-ranging, and occurs on the Atlantic slope as well as westward. It is smaller in general than var. *sphenostachya* and its capsules (FIG. 3) are 1–1.6 mm. long, the largest ones reaching the measurements of the smallest in var. *sphenostachya*. Such transitional specimens are, naturally, difficult to pigeon-hole.

NYMPHOIDES **cordatum** (Ell.), comb. nov. *Villarsia cordata* Ell., Sk. Bot. S. C. and Ga. i. 230 (1816 or '17). *V. lacunosa* sensu Eaton Man. Bot. No. Mid. States, ed. 2, pt. 2: 492 (1818); sensu Torr. Fl. No. Mid. U. S. i. 215 (1824); sensu Bigel. Fl. Bost. ed. 2: 78 (1824); and later authors, not Ventenat, Choix des Plantes, 9 (1803). *Limnanthemum lacunosum*, α. Griseb. Gen. Sp. Gent. 47 (1839), as to plant described, not as to source of specific epithet. *N. lacunosum* Fernald in RHODORA, x. 54 (1908), as to plant, not as to source of specific epithet.

We have two native species of *Nymphoides:* one a small plant, ranging from Florida and Louisiana northward to southeastern Canada and Newfoundland, known in recent works as *N. lacunosum* or *Limnanthemum lacunosum;* the other much coarser, occurring from Florida to Texas, and northward on the coastal plain to Delaware and southern

Photo. H. G. Fernald.

AGRIMONIA STRIATA: FIG. 3, fruit, × 8.

A. STRIATA, var. CAMPANULATA: FIG. 1, plant, × ⅜, from Arizona; FIG. 2, fruit, × 8, from TYPE.

Photo. E. C. Ogden.

POLYGALA VERTICILLATA: FIG. 1, one of the 2 plants in Linnean Herbarium (TYPE), × 1, *courtesy of* Mr. Spencer Savage.

Var. ISOCYCLA: FIG. 2, TYPE, × 1; FIG. 3, raceme, × 4, from TYPE.

Var. SPHENOSTACHYA: FIG. 4, raceme, × 4, from ISOTYPE.

New Jersey, known, correctly, as *N. aquaticum* (Walt.) Ktze. The two are distinguished as follows:

N. CORDATUM (N. LACUNOSUM of recent authors). Floating leaves with filiform smooth petioles, the cordate-ovate blades 1.5–5 cm. broad, often mottled or variegated above, scarcely or only minutely pitted beneath; spur-roots frequent; calyx 3–5 mm. long; corolla 0.5–1 cm. broad; capsule ovoid-subglobose, 3–5 mm. long; seeds smooth.

N. AQUATICUM. Floating leaves with cord-like often purple-glandular petioles, the suborbicular to reniform thick blades 0.4–1.5 dm. broad, usually green above, abundantly and coarsely vesicular and pitted beneath; spur-roots less frequent; calyx 4–8 mm. long; corolla 1–2 cm. broad; capsule elongate, 6–9 mm. long; seeds glandular-roughened.

The first North American species defined was *Anonymos aquatica* Walt. Fl. Carol. 109 (1788), clearly described "foliis peltato-reniformibus, coriaceis, subtus punctatis," etc. It was also described as *Menyanthes trachysperma* Michx. Fl. Bor.-Am. i. 126 (1803): "M. habitu nymphoideo . . . seminibus vesiculis ovatulo-oblongis conspicue scabris." There is no question as to the plants of Walter and of Michaux; and Michaux cited *Villarsia aquatica* (Walt.) Gmel. as the same as his *Menyanthes trachysperma*, giving a new name descriptive of the characteristic seeds.

No distinction was noted by the northern botanists, Eaton, Torrey, Bigelow and others of their period, because they knew only the slender and small northern species; and when Grisebach treated the genus he created a confusion which every one has followed, although in 1912, in a foot-note, Dr. Witmer Stone[1] noted the error involved. Considering both our plants as constituting one species with two varieties, Grisebach, l. c., called the small plant *Limnanthemum lacunosum*, α., with the synonym, derived from an herbarium-name, *Menyanthes punctata* Muhl.; the larger plant, *L. lacunosum*, β. *australe*, "magnitudo decies major, lacunis quoque majoribus," with *Anonymos aquatica* Walt., *Villarsia aquatica* (Walt.) Gmel. and *Menyanthes trachysperma* Michx. cited as belonging to it. Most singularly, Grisebach cited *Villarsia lacunosa* Ventenat as belonging to his var. α., not to his var. β.; and Gray, Britton and most others have faithfully followed Grisebach's erroneous course as to the identity of *Villarsia lacunosa*. Furthermore, northern botanists, familiar with the lake- or pond-habitat of the small species, have forced the Latin name into signifying the habitat.

Ventenat, however, as pointed out by Stone, was simply giving to

[1] Stone, Pl. So. N. J. 644 (1912).

the large southern plant a new specific name, a substitute for those already given it; and the new and quite *illegitimate* name was in recognition of the superabundant pits (lacunae) in the lower leaf-surface! Here is Ventenat's treatment:

"Le genre VILLARSIA comprend les espèces suivantes:

V. lacunosa (ANONYMOS *aquatica*, WALTHER, *Flor. Carolin.* VILLARSIA *aquatica* (2). GMEL. *Syst. Veget.* et BOSC, *Bullet. de la Soc. Philom.*) Foliis reniformibus, subpeltatis, subtus lacunosis, natantibus; petiolis floriferis; corollis glabris."[1]

That *Villarsia lacunosa* Vent. was merely the coarse southern plant is sufficiently evident. Surely the name did not apply to the slender and usually more northern species nor can it be used for any species, being merely a substitute or illegitimate name.

Stephen Elliott clearly understood the two plants. The coarse southern species he called *Villarsia trachysperma*, based on *Menyanthes trachysperma* Michx., with Walter's *Anonymos aquatica* as a synonym, and described: "*Leaves* . . . frequently orbicular, 3–4 inches in diameter, . . . underneath . . . covered with vesicular points. *Petioles* . . . dotted, sometimes roughened . . . Flowers June."[2] The slender plant was beautifully described by him as *Villarsia*

"1. CORDATA. E.

V. foliis cordatis, integerrimis; petiolis floriferis. E.	Leaves cordate, very entire; petioles bearing the flowers.

Grows in shallow streams. *Petioles* . . . slender, glabrous. *Leaves* about an inch long, exactly cordate, variegated. . . . . Flowers July–September."

A fragment of Elliott's type, long ago secured by Asa Gray, is wholly characteristic.

Treating the small-leaved and slender plant as *Limnanthemum lacunosum* (following Grisebach), Gray gave in the synonymy in the Synoptical Flora Elliott's name, saying "*V*[*illarsia*] *cordata*, Ell. Sk. i. 230, a fitter name." Not only is it "a fitter name"; so far as I have found, it is the only name that fits.

HALENIA DEFLEXA (Sm.) Griseb., forma **heterantha** (Griseb.), comb. nov. *H. heterantha* Griseb. Gen. Sp. Gent. 325 (1839). *H. deflexa*, var. *heterantha* (Griseb.) Fern. in RHODORA, i. 37 (1899).

[1] Vent. Choix des Plantes, 9 (1803).
[2] Ell. Sk. Bot. S. C. and Ga. i. 230 (1816 or '17).

Although spurless flowers frequently occur late in the season on plants which early produced spurred corollas, the spurless flowers often are the only ones produced. Forma *heterantha* is, then, a peculiarly interesting reversionary form.

HYDROPHYLLUM VIRGINIANUM L., forma **simplicifolium**, f. nov. (TAB. 502), foliis simplicibus laminis 4–9 cm. longis lobis obtusis; calicibus 3–4 mm. longis; corollis 5–6 mm. longis lobis angustis.—VERMONT: rich woods, Charlotte, June 6, 1879, *Pringle* (TYPE in Gray Herb.).

The extraordinary plant shown in plate 502, × 2/5, was labelled by the late Sereno Watson as an unpublished new species. Its publication was stopped by a letter coming from Pringle, stating that search through the area showed that no fruit was set and that in some cases forma *simplicifolium* was springing from rhizomes which likewise bore the typical large-flowered and large- and pinnate-leaved *Hydrophyllum virginianum*. This letter of Pringle's suggests that forma *simplicifolium* is a root-sport. It is so remarkable that it would be of great interest to rediscover it.

HACKELIA **americana** (Gray), comb. nov. (PLATE 503). *Echinospermum deflexum*, var. *americanum* Gray in Proc. Am. Acad. xvii. 224 (1882). *Lappula deflexa*, var. *americana* (Gray) Greene, Pittonia, ii. 183 (1891). *L. americana* (Gray) Rydberg in Bull. Torr. Bot. Cl. xxiv. 294 (1897). *Hackelia deflexa* sensu I. M. Johnston in Contrib. Gray Herb. n. s. lxviii. 45 (1923), as to North American plant, not (Wahlenb.) Opiz. *H. deflexa*, var. *americana* (Gray) Fernald & Johnston in Fernald in RHODORA, xxvi. 124 (1924).

Although all students of the *Boraginaceae*, except Rydberg, have treated the plant of calcareous slopes and bluffs, which occurs from the Gaspé Peninsula, Quebec to southern British Columbia, south interruptedly to northern New Brunswick, northern Vermont, the Bruce Peninsula, Ontario, northern Michigan, Wisconsin, Iowa, Nebraska, Montana, Idaho and Washington, as conspecific with the Eurasian *Hackelia deflexa* (Wahlenb.) Opiz (PLATE 504) (or *Myosotis deflexa* Wahlenb., *Echinospermum deflexum* (Wahlenb.) Lehm., *Lappula deflexa* (Wahlenb.) Roth), there are several very marked characters which separate them.

Gray's original account, under *Echinospermum*, was as follows:

"E. DEFLEXUM, Lehm. Nutlets only marginally glochidiate, with the dorsal disk minutely scabrous: in var. AMERICANUM (which makes some approach to *E. Virginicum*) the somewhat more granulate dorsal disk

not rarely bears two or three small glochidiate prickles on an obscure mid-nerve!"

Gray had four specimens before him: Clinton County, Iowa, *Geo. D. Butler:* Lake Winnipeg, *Bourgeau:* Saskatchewan, *Bourgeau:* West Kootenay, *Lyall.* The Bourgeau sheet from Saskatchewan alone bears Gray's varietal name in his hand and the pocketed fruits with his memoranda; it should stand as the TYPE. The character used by Gray is wholly variable; consequently, in revising the material in the Gray Herbarium in 1915, Mr. J. Francis Macbride ticketed it all *Lappula deflexa.* These revision-labels of Macbride's have superimposed upon them those of Dr. I. M. Johnston in 1923, agreeing as to identity, but calling the plant *Hackelia deflexa,* an unequivocal reduction of the American plant to the species of eastern Europe and Asia maintained in Johnston's detailed *Restoration of the Genus Hackelia*— Contrib. Gray Herb. n. s. lxviii. 45 (1923). Very familiar with the American plant as it occurs on the limy talus and bluffs of Gaspé, I could not feel that its broader and more acuminate leaves and the narrower and straight-edged deltoid nutlets indicated exact identity with the Eurasian plant with narrow leaves and more ovate nutlets. I consequently induced Dr. Johnston in 1924 to join me in reviving var. *americana* under *H. deflexa.*

Now, however, faced with the necessity of reviewing the situation in rewriting Gray's Manual, I find so many differences that I am unable to unite the Old World *Hackelia deflexa* and the American *H. americana* and in the Gray Herbarium am superimposing a third revision-slip on the two already there! Briefly the differences are these:

H. DEFLEXA (PLATE 504, FIGS. 1–7). Cauline leaves linear-lanceolate to narrowly oblanceolate, obtuse or merely acute, 0.25–2 cm. broad; racemes with some flowers usually supraaxillary (FIGS. 1–3), the mature pedicels mostly 0.5–2.5 cm. apart; bracts (FIGS. 1–3) of the ascending racemes well developed, the lower and usually all with dilated obtuse or merely acutish blades; expanded corollas (FIG. 4) 3–6 mm. broad; mature fruit (FIGS. 5–7) with nutlets intact and, including glochidia, 4–6 mm. long; open back of mature nutlet (FIGS. 5–7) ovate, 1.5–2 mm. broad, with blunt pebbling and with an elevated wing-margin formed by the fused lanceolate flat bases of the glochidia.

H. AMERICANA (PLATE 503). Cauline leaves elliptic-lanceolate to narrowly elliptic-ovate, mostly acuminate, the principal ones 0.5–3 cm. broad; flowers mostly approximate to their bracts (FIGS. 1, 3 and 4), the mature pedicels 3–10 (rarely –20) mm. apart; bracts (FIGS. 1, 3 and 4) of the less ascending racemes poorly developed, the lowest with lance-acuminate blades, all the others greatly reduced and inconspicuous,

Photo. H. G. Fernald.

HYDROPHYLLUM VIRGINIANUM, forma SIMPLICIFOLIUM: TYPE, × 2/5.

Photo. H. G. Fernald.

HACKELIA AMERICANA: FIG. 1, portions of plant, × 1, from Michigan; FIG. 2, expanded flower, × 4, from Michigan; FIGS. 3 and 4, fruiting branches, × 1, from Quebec; FIG. 5, fruit, × 8, from Quebec; FIG. 6, nutlet, × 8, from Michigan.

linear-attenuate; expanded corollas (FIG. 2) 1.5–3 mm. broad; mature fruit (FIGS. 5 and 6) including glochidia, 3–4.8 mm. long; open back of mature nutlet narrowly deltoid-ovate, 1–1.5 mm. broad, muriculate-pebbled, the marginal glochidia mostly distinct and linear-subulate.

In the plates illustrating details of the two species the habit is shown, × 1; the portions of inflorescence showing bracts and pedicels, × 1; details of flowers, × 4 and fruits, × 8. In *Hackelia americana* the calyx has fine and less rigid strigose pubescence than in *H. deflexa;* and the backs of the nutlets are more generally hispid than in *H. deflexa.* The latter character is too variable, however, to be emphasized, as is the tendency in *H. americana* sometimes to bear a few glochidia (FIG. 6) on the back of the nutlet. When these occur *H. americana* somewhat suggests *H. virginiana* (L.) I. M. Johnston. The latter has foliage similar to that of *H. americana* but larger, and its flowers are nearly as small and its racemes similarly bracted; but in *H. virginiana* the short-pediceled fruits (PLATE 504, FIG. 8) are subglobose and the ovate backs of the nutlets are almost hidden by the abundant glochidia.

I am taking up *Hackelia* Opiz for the species with deflexed pedicels which have long been included under *Lappula.* This I do in deference to the vastly superior knowledge of generic lines in the *Boraginaceae* of Dr. Johnston. In his *Restoration of the Genus Hackelia,* already referred to, he gave the generic distinctions as follows:

"LAPPULA. Annual; inflorescence abundantly bracteate; pedicels erect; gynobase subulate, 5–10 times as tall as broad, about equaling the nutlets; style surpassing the nutlets; nutlets narrowly attached all along the well developed medial ventral keel.

HACKELIA. Biennial or perennial; inflorescence naked or rarely sparsely bracteate; pedicels recurved or deflexed in fruit; gynobase pyramidal, less tall than broad; style definitely surpassed by nutlets; nutlets attached by a large oblique submedial ovate or deltoid areola; ventral keel extending over only upper half of nutlet."

The characters of the fruit and the gynobase are, I take it, constant; so, apparently, is the duration of the plants. The type of *Hackelia, H. deflexa,* has a bract opposite or alternating with many or all flowers; so have the two species of Atlantic North America above noted. As a fundamental generic character the *lack* of bracts is not well displayed in these three species. It is likewise significant that in 1924, in a synopsis of the American species of *Lappula,* which in 1923 had as one of its generic distinctions "style surpassing the nutlets", the monographer should have used as a key-character

separating *L. brachystyla* from *L. Redowskii* "Style exceeded by nutlets" in the former, opposed to "Style surpassing nutlets" in the latter.

ERIGERON ELATUS Greene, var. **oligocephalus** (Fern. & Wieg.), comb. nov. *E. acris*, var. *oligocephalus* Fern. & Wieg. in RHODORA, xii. 226 (1910) as to TYPE, *Fernald & Wiegand*, no. 4138. PLATE 505, FIGS. 1 and 2.

The species of *Erigeron* § *Trimorphaca* (Cass.) DC. are as baffling as any in the genus. In temperate eastern North America the section is represented by the quite characteristic *E. lonchophyllus* Hook. (*E. armerifolius* Turcz.) on Anticosti, the Mingan Islands and adjacent mainland of Saguenay County, Quebec, there isolated from the West, and the three very characteristic plants which have passed as *E. acris* L. and varieties of it. Typical *E. acris* of Europe (extending across Asia) does not seem to occur in North America. Habitally somewhat like the Eurasian and North American plant which has erroneously passed as *E. acris* (or as its var. *droebachensis* (O. F. Muell.) Blytt or var. *asteroides* (Andrz.) DC.), it has nonglandular peduncles and involucres, the latter coarsely hispid (FIG. 5). The wide-ranging plant which crosses North America has glandular-pruinose peduncles (FIG. 4) and the involucral bracts essentially glabrous except for glandularity or viscidity. This is *E. elongatus* Ledeb. Ic. Fl. Alt. i. 9, t. 31 (1829) which was more fully described by Ledebour in Fl. Alt. iv. 91 (1833). It is also, perhaps, *E. droebachensis* O. F. Mueller in Fl. Dan. v. fasc. xv. t. dccclxiv (1782), which was published in a largely polynomial work and which did not receive validation, apparently, until taken up by Fries, Summ. Veg. Scand. 183 (1846). The exact application of the name *E. droebachensis* is open to doubt, several Scandinavian authors placing it with *E. acris*, others (Lindman, for instance) indicating it as a mixture. Our plant is likewise, apparently, the one treated by DeCandolle, Prodr. v. 290 (1836) as *E. acris*, var. *asteroides*, based on the doubtful *E. asteroides* Andrz. The first name for this plant which is wholly free from doubt and the one used by Lindman, Hultén and other progressive students of boreal floras is *E. elongatus* Ledeb. Later names are *E. yellowstonensis* A. Nels. in Bot. Gaz. xxx. 198 (1900) and *E. lapiluteus* A. Nels. in Coult. & Nels. Man. Bot. Rocky Mts. 530 (1909). In the Rocky Mountains *E. elongatus* sometimes has hispid peduncles and involucres; consequently Gray took it to be true *E. acris* and under the latter name he

included specimens of all the plants here considered, even including *E. lonchophyllus*. All these Rocky Mountain specimens which I have seen, however, of the tall and stiff plant have the pruinose-glandular peduncles and bracts, the glands somewhat hidden by the long trichomes. To me it seems to be merely an extreme of *E. elongatus*.

Erigeron elatus Greene, Pittonia, iii. 164 (1897), said to be *E. alpinus*, var. *elatus* Hook. Fl. Bor.-Am. ii. 18 (1834), was given a full description by Greene. Its stems "bearing at summit either a solitary rather large head, or 3 to 5, which are slender-peduncled and subcorymbose . . . involucres 4 or 5 lines high and 6 in breadth, bracts linear-acuminate, almost hispidly short-hirsute, not glandular, unequal, the outer little more than half the length of the inner" show that Greene was describing, as he said, a plant "common in the mountains of British Columbia, where Mr. Macoun has repeatedly collected it." Plants sent out by Macoun as *E. elatus* and similar ones of earlier date are exactly the plant called by me *E. acris*, var. *arcuans* in RHODORA, XXVIII. 236 (1926). A characteristic involucre, × 2, is shown in FIG. 3.

As I see it, we must accept *Erigeron elatus* as the plant clearly defined by Greene, although he drew his name from *E. alpinus*, var. *elatus* Hook. Fl. Bor.-Am., for there is absolutely nothing in Hooker's account to show what he had. *E. alpinus* is a very definite European species not represented with us, except by *E. borealis* (Vierh.) Simmons in arctic America; and it differs from all representatives of *E. acris* in having double, instead of single pappus. Hooker, misidentifying something as *E. alpinus*, had a var. β. without name, and "γ. *elata;* subpedalis." Surely the mere statement of height, without any other character, is not enough; at best *E. alpinus*, var. γ. *elatus* Hook. was a *nomen submudum*. It so happens that Hooker gave to Asa Gray as his var. γ. *elatus* a specimen which is not the small-headed plant described by Greene. It seems to be the large-headed extreme which is represented by the type of *E. acris*, var. *oligocephalus* Fern. & Wieg. In view of Greene's clear and unusually careful definition of the smaller-headed extreme of *E. elatus* and Hooker's quite undistinguishing word under his *E. alpinus*, var. γ. *elatus*, it would be pushing the type-concept to its utmost absurdity to say that Greene's *E. elatus* is not the plant he accurately described, because, without more than wrongly guessing as to the identity of Hooker's plant, he cited the latter. I, therefore, maintain *E. elatus* Greene for

the plant he described, treating the seeming source of the name, *E. alpinus*, var. γ. *elatus* Hooker, as inadequately defined and, therefore, not adequately published. Doubtless some extremely literal botanists will view the matter differently!

As I just now interpret the representatives of *Erigeron* § *Trimorphaea* ("just now" because any treatment is unsatisfactory and tentative) in temperate eastern North America, they may be distinguished by the following key.

a. Peduncles glandular-pruinose or viscid; involucral bracts glabrous or nearly so, glandular or viscid; inflorescence an elongate raceme or thyrsiform to corymbiform panicle of (4–)7–80 heads on stiffly spreading-ascending peduncles; involucres 5–8 mm. high; stems 2–8 dm. high. . . . . 1. *E. elongatus.*

a. Summits of peduncles and involucral bracts copiously hispid or villous, glandless; stems 0.2–4.5 dm. high. . . . *b.*

b. Cauline leaves narrowly linear; heads 1–70, on erect peduncles; no filiform pistillate flowers between the marginal ligulate and the perfect central flowers.

Stems 1–4.5 dm. high; leaves scattered up the stem into the inflorescence; some of the 3–70 peduncles in the axils overtopped by the leaves. . . . . 2. *E. lonchophyllus.*

Stems 0.2–1.3 dm. high; leaves crowded at base, the cauline reduced to tiny linear bracts; heads 1 or 2 (rarely 3), terminating the scapiform stem . . . . . 2a. *E. lonchophyllus*, var. *laurentianus.*

b. Cauline leaves linear-oblong, lanceolate or oblanceolate; heads 1–8, on elongate flexuous or arching peduncles; filiform pistillate flowers forming a ring between the ligulate and the perfect tubular central flowers.

Involucres 5–9 mm. high, of 20–36 bracts, the outer bracts ½–nearly equaling the inner; disks of leading heads 0.8–1.5 cm. broad. . . . . 3. *E. elatus.*

Involucres 7–12 mm. high, of 36–60 bracts, the outer mostly about equaling the inner; disks of leading heads 1.5–2 cm. broad. . . . . 3a. *E. elatus*, var. *oligocephalus.*

1. E. ELONGATUS Ledeb. Ic. Fl. Alt. i. 9, t. 31 (1829). *E. droebachensis* sensu Am. botanists, perhaps not *E. droebachensis* O. F. Muell. in Fl. Dan. v. fasc. xv. t. dcccIxiv (1782), chance binomial in polynomial volume, validated by Fries, Summ. Veg. Scand. 183 (1846). *E. glabratus* Hook. Fl. Bor.-Am. ii. 18 (1834), not Hoppe. *E. acris*, var. *asteroides* sensu DC. Prodr. v. 290 (1836), based on the doubtful *E. asteroides* Andrz. *E. acris* and var. *droebachensis* at least in sense of Gray, Syn. Fl. N. Am. i². 219, 220 (1884). *E. yellowstonensis* A. Nels. in Bot. Gaz. xxx. 198 (1900). *E. lapiluteus* A. Nels. in Coult. & Nels. Man. Bot. Rocky Mts. 530 (1909).—Damp banks, open sands, thickets and clearings, Hamilton River, Labrador Peninsula to Alaska, south to Anticosti Island and Gaspé Peninsula, Quebec, northern New Brunswick, northern Maine, northern Michigan, Manitoba, Saskatchewan, Colorado, Utah and Oregon; northern Eurasia.—An involucre, × 2, is shown in FIG. 4.

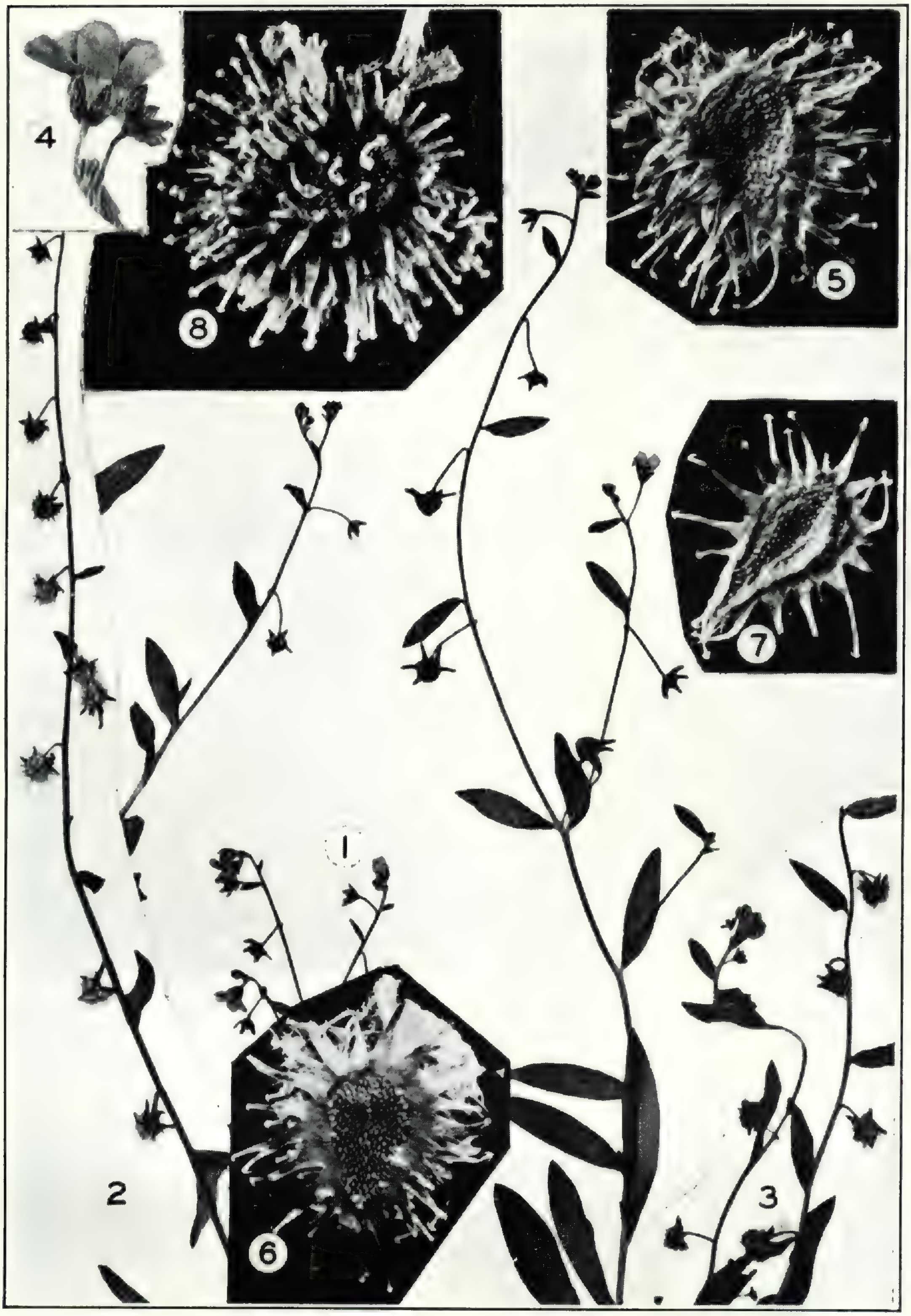


Photo. H. G. Fernald.

HACKELIA DEFLEXA: FIG. 1, portions of plants, × 1, from Torne Lappmark; FIG. 2, fruiting branch, × 1, from the Altai; FIG. 3, branches, × 1, from Bohemia; FIG. 4, flower, × 4, from Torne Lappmark; FIG. 5, fruit, × 8, from Songaria; FIG. 6, fruit, × 8, from Switzerland; FIG. 7, nutlet, × 8, from Norway.

H. VIRGINIANA: FIG. 8, fruit, × 8, from Massachusetts.

Photo. H. G. Fernald.

ERIGERON ELATUS: FIG. 3, head, × 2.

E. ELATUS, VAR. OLIGOCEPHALUS: FIG. 1, one of TYPE-SPECIMENS, × 1; FIG. 2, head, × 2.

E. ELONGATUS: FIG. 4, head, × 2.

E. ACRIS: FIG. 5, head, × 2.

E. BOREALIS: FIG. 6, head, × 2.

2. E. LONCHOPHYLLUS Hook. Fl. Bor.-Am. ii. 18 (1834). *E. armerifolius* Turcz. ex DC. Prodr. v. 291 (1836); *E. armeriaefolius* Gray in Proc. Am. Acad. viii. 648 (1873) and Syn. Fl. N. Am. i^2. 220 (1884), change of spelling. *E. racemosus* Nutt. Trans. Am. Phil. Soc. n. s. vii. 312 (1841).—Calcareous gravels, meadows and ledges, Mingan Islands and Anticosti Island, Quebec; Yukon and Alaska to South Dakota, New Mexico and California; Asia.

2a. Var. LAURENTIANUS Victorin in Trans. Roy. Soc. Can. ser. 3, xx. (sect. v). 476 (1926).—Mingan Islands, Anticosti Island and adjacent mainland of Saguenay County, Quebec.

3. E. ELATUS Greene, Pittonia, iii. 164 (1897). *E. acris*, var. *oligocephalus* Fern. & Wieg. in RHODORA, xii. 226 (1910), excluding type. *E. acris*, var. *arcuans* Fern. in RHODORA, xxviii. 236 (1926).—Calcareous shores, gravels and turf, River Ste. Anne des Monts, Gaspé County, Quebec; northeastern Manitoba (Churchill) to Mackenzie, south in the Rocky Mountains of Alberta and British Columbia. An involucre, × 2, is shown in FIG. 3.

3a. Var. OLIGOCEPHALUS (Fern. & Wieg.) Fernald. *E. acris*, var. *oligocephalus* Fern. & Wieg. in RHODORA, xii. 226 (1910), as to type. *E. borealis* sensu Fernald in RHODORA, xxviii. 236 (1926), not (Vierh.) Simmons (1913).—Calcareous slopes, Labrador, easternmost Saguenay County, Quebec (Blanc Sablon, formerly included in Labrador) and northern Newfoundland. FIG. 1 shows one of the type-specimens, × 1; FIG. 2, an involucre, × 2.

As already pointed out, a specimen from somewhere in the Canadian Rocky Mountain region given to Gray by Hooker, as belonging to his inadequately published *Erigeron alpinus*, γ. *elatus*, is near if not quite *E. elatus*, var. *oligocephalus*. In 1926, accepting the identification by students of the Scandinavian and Greenland floras, I treated the plant of Labrador and Newfoundland as *E. borealis*. Abundant material of the latter plant of northern Europe and Greenland now shows it to be only slightly and perhaps not satisfactorily separable from the European *E. alpinus*. In its more ligneous rhizome, its firm and consistently small cauline leaves, its usually solitary erect head, its more villous involucre, its comparatively broad and conspicuous ligules and its double pappus *E. borealis* is quite distinct from *E. elatus* and its var. *oligocephalus*. A head of the Swedish *E. borealis* is shown, × 2, in FIG. 6.

ERIGERON RAMOSUS (Walt.) BSP., forma **discoideus** (Robbins), comb. nov. *E. strigosus* Muhl., var. *discoideus* Robbins ex Gray, Man. ed. 5: 237 (1867). *E. ramosus*, var. *discoideus* (Robbins) BSP. Prelim. Cat. N. Y. Pl. 27 (1888).

AMBROSIA TRIFIDA L., forma **integrifolia** (Muhl.) comb. nov.

A. integrifolia Muhl. in Willd. Sp. Pl. iv. 375 (1805). *A. trifida*, β. *integrifolia* (Muhl.) Torr. & Gray, Fl. No. Am. ii. 290 (1842).

The Varieties of Bidens coronata (plate 506).—*Bidens coronata* (L.) Britton, the plant which long passed by the later name *B. trichosperma* (Michx.) Britton (not the strictly southern *B. mitis* (Michx.) Sherff, which long passed erroneously as *B. coronata*) has four well defined geographic varieties. As treated by Sherff in his *Genus Bidens*, pt. 1: 221 (1937) only two varieties are recognized:

> "Foliola plerumque lanceolato-linearia et inciso-dentata, achaeniis corpore 5–7 mm. longis.....*B. coronata* sensu stricto.
> Foliola (segmentave) angustissime linearia et saepe etiam integra, achaeniis minoribus.....Var. β. *tenuiloba.*"

According to Sherff's treatment var. *tenuiloba*, based by Gray on material from Indiana and Illinois, occurs "With the species proper and usually commoner."

When, however, we attempt to place specimens with lanceolate leaf-segments and achenes 9 mm. long, others with lanceolate segments and achenes 4.5 mm. long we become puzzled; when, furthermore, plants with linear segments only 1 mm. broad have achenes 7.5 mm. long, the inadequateness of present treatments of the species becomes more apparent. I am accordingly proposing the following treatment which recognizes four fairly defined geographic varieties.[1]

[1] The geographic segregates within the species and the geographic ranges in general would have been more evident if Sherff had followed the conventional geographic sequence in citation of specimens. To most users of a monograph the arrangement of cited specimens in a familiar geographic sequence is of far greater importance than the mere citation of specimens in alphabetical sequence of collector's names. The latter is a secondary item; the former records a fact usually of permanent significance. Without a logical geographic sequence in citation grave errors enter the generalizations. For instance, on his p. 315 Sherff gives the range within the United States of *Bidens laevis:* "From New Hampshire and Massachusetts southward along the coast to Florida and westward from Florida to California." From this generalization one would never guess that *B. laevis* grows in western New York and in West Virginia. Neither of these areas is "along the coast" nor "westward from Florida to California." Nevertheless, under the cited specimens one from Cayuga Marshes, New York comes between specimens recorded from Argentina and from Rhode Island, merely because the Argentina plant was distributed in the series, *Chloris Platensis Argentina*, the New York plant was collected by *Clinton* and the Rhode Island specimen seen was from *Congdon*. The West Virginia specimen cited is lost in five pages of geographically disorganized matter under the name *Guttenberg*.

Handel-Mazzetti has already protested this unscientific method of citing specimens (Oesterr. Bot. Zeitschr. lxxxvii.[2] 154) and he specially protests the incorrect entering under V of the Germanic prefix "von." He might have noted also that ubiquitous and unidentifiable collector "*anon.*" whose specimens are recorded in this sequence: Pennsylvania, Hawaii, and North Carolina. Every experienced taxonomist with whom I have conferred has urged the protesting of this novel method of citation.

a. Longest central achenes 6–9 mm. long.
Awns of central achenes 2.8–3.7 mm. long; larger outer achenes 5–6 mm. long, with awns mostly 2–2.6 mm. long; larger leaf-segments 4–20 mm. broad; outer involucre loosely ascending or spreading; plant of the interior
B. coronata, var. *typica.*
Awns of central achenes 0.6–1.8 mm. long; larger outer achenes 3.7–6 mm. long, with awns 0.6–1 mm. long; larger leaf-segments 1–12 mm. broad; outer involucre appressed-ascending . . . . . Var. *brachyodonta.*
a. Longest central achenes 4.5–6 mm. long; larger leaf-segments 1–12 mm. broad.
Ligules 1.5–2.5 cm. long; awns of central achenes 1–2 mm. long; larger outer achenes 3–5.2 mm. long, with awns 0.4–1.6 mm. long; plants of the interior . . . . . Var. *tenuiloba.*
Ligules 1.2–1.7 cm. long; awns of central achenes 1.8–3 mm. long; larger outer achenes 4.7–6 mm. long, with awns 1.5–1.8 mm. long; plant of Atlantic states . . . . . Var. *trichosperma.*

B. CORONATA (L) Britton, var. **typica.** Figs. 4 and 5. *Coreopsis coronata* L. Sp. Pl. ed. 2, ii. 1281, as to descr. and specimen matching it in Herb. L. (1763). *Diodonta coronata* (L.) Nutt. in Trans. Amer. Phil. Soc. ser. 2, vii. 360 (1841). *B. coronata* (L.) Britton in Bull. Torr. Bot. Cl. xx. 281 (1893); Sherff in Bot. Gaz. lvi. 495 (1913) and Gen. Bidens, pt. 1: 221, in part, t. lix., figs. *m.* and *p–u* (1937).—Prairies, swales and rich bottoms, Connecticut Valley, Connecticut to southern Ontario and Nebraska, south to Delaware Valley, New Jersey, Pennsylvania, Ohio, Indiana and Illinois.

Var. **brachyodonta**, var. nov. (TAB. 506, FIG. 1–3), foliorum segmentis linearibus vel anguste lanceolatis 1–12 mm. latis; involucris exterioribus 4.5–10 mm. longis, interioribus 5.5–7 mm. longis; ligulis 1.5–2.8 cm. longis; achaeniis exterioribus 3.7–6 mm. longis 1.9–2.4 mm. latis aristis 0.6–1 mm. longis; achaeniis centralibus longioribus 6–7.5 mm. longis 1.2–1.8 mm. latis aristis 0.6–1.8 mm. longis.—Bogs and peaty swamps, Essex County, Massachusetts to Delaware. The following, from a large series, are characteristic. MASSACHUSETTS: swale near Pilling Pond, Lynnfield, October 21, 1917, *Fernald;* wet sphagnous clearing near Chebacco Lake, Essex, September 11, 1913, *Fernald, Hunnewell & Long*, no. 10,690; black spruce bog, North Reading, August 31, 1932, *W. B. Drew;* Fresh Pond, Cambridge, September 3, 1853, *Wm. Boott;* wet meadows of Neponset River, Dedham, September 6, 1901, *Day & Fernald* in Pl. Exsicc. Gray. no. 48 (as *B. trichosperma*); Broad Meadows, Needham, September 13, 1891, *T. O. Fuller;* Lakeville, September 25, 1903, *E. W. Hervey;* open swamps, Easton, October 18, 1919, *C. F. Batchelder;* swamp, Raynham, September 15, 1923, *Cheever & Knowlton;* boggy meadows near Fresh Pond, Dennis, September 2, 1918, *Fernald*, no. 17,612; cranberry bogs, Harwich, October 13, 1918, *Fernald*, no. 17,613 (TYPE in Gray Herb.). RHODE ISLAND: South Kingston, 1850, *S. T. Olney.* NEW YORK: Merricks, Long Island, September 8, 1916, *House.* DELAWARE: high

ground near Newport, New Castle County, September 9, 1899, *Canby*.

With the exception of var. *typica* in the Connecticut Valley, var. *brachyodonta* is the one variation of *Bidens coronata* in New England and apparently the only one on Long Island. It is presumably in New Jersey, since Canby collected it in Delaware. Its leaf-segments vary rather indiscriminately, even in the same colonies, from narrowest linear to lanceolate. Its achenes are nearly as large as in var. *typica* but the awns are strikingly shorter.

Var. TENUILOBA (Gray) Sherff in Bot. Gaz. lxxxvi. 446 (1928). FIGS. 6 and 7. *Coreopsis trichosperma* Michx., var. *tenuiloba* Gray, Syn. Fl. N. Am. i^2. 295 (1884). *B. trichosperma*, var. *tenuiloba* (Gray) Britton in Bull. Torr. Bot. Cl. xx. 281 (1893).—Bogs and swales, southern Ontario to Minnesota, south to Ohio, Indiana, Illinois, Iowa and Nebraska.

Although var. *tenuiloba* has been treated as merely a narrow-lobed and small-fruited phase of *Bidens coronata*, it should be noted that its leaf-segments are highly variable and may be quite like those of var. *typica*. The original material which Gray had before him showed such range of variation in the foliage; but its achenes are shorter than in var. *typica* and their awns are very much shorter. The series seems to be a reasonably defined variety and, singularly enough, its counterpart is on the coastal plain from New Jersey to Florida, which shows in length of awns a closer approach to var. *typica* of the interior. The latter plant is

Var. **trichosperma** (Michx.) comb. nov. FIGS. 8 and 9. *Coreopsis trichosperma* Michx. Fl. Bor.-Am. ii. 139 (1803). *B. trichosperma* (Michx.) Britton in Bull. Torr. Bot. Cl. xx. 281 (1893).—Bogs and swamps, New Jersey and eastern Pennsylvania to Florida. The following, from among many sheets, are typical. NEW JERSEY: Moonachie, September 21, 1901, *E. E. Magee;* Woodbridge, September 21, 1889, *J. R. Churchill.* PENNSYLVANIA: wet soil, Tullytown, September 20, 1930, *W. M. Benner.* VIRGINIA: tidal marsh, Capitol Landing, Queen's Creek, Charles City County, *Grimes*, no. 4291; border of tidal marsh along Gray's Creek, near Cross Creek Landing, south of Swann Point, *Fernald & Long*, no. 6909 (see FIG. 8); Northwest, Norfolk County, *Heller*, no. 1247. GEORGIA: swamp of Satilla River, near Woodbine, Camden Co., *Harper*, no. 1562 (see FIG. 9).

Var. *trichosperma* is, if the slight representation in the Gray Herbarium from Virginia southward can be taken as indicative, the only variation of *Bidens coronata* in the Southeast. In its very short

achenes it approaches, as has repeatedly been noted, the southern *B. mitis* (Michx.) Sherff, but the achenes are minutely strigose-ciliolate, with awns 1.5–3 mm. long, whereas all good achenes of *B. mitis* (FIG. 10), which I have examined, run smaller (2–5 mm. long), have glabrous margins and have shorter awns (at most up to 1 mm. long on the central achenes, almost obsolete and blunt on the marginal achenes). Although Sherff (Genus Bidens, pt. 1: 231, in footnote) specially selects Harper's no. 1562 (FIG. 9) as typical of *B. mitis*, the sheet thus marked by him in the Gray Herbarium has, it seems to me, the characteristic achenes of *B. coronata*, var. *trichosperma*. As to the identity of *Coreopsis trichosperma*, Michaux described it from "humidis Carolinae superioris" immediately before his *C. mitis*. Mr. J. Francis Macbride, now in Paris, has most kindly made comparison of achenes with those of Michaux's two types involved and reports that the type of *Coreopsis trichosperma* is too young for proper comparison but that the plant looks like the coastwise series with narrow leaf-segments. The type of *C. mitis* has 2 central achenes left. One of these has been sent me, through Mr. Macbride, by Professor Pellegrin for examination and return to the Michaux herbarium. It is quite smooth on the margins, 5 mm. long and with no true awns, merely broadly deltoid low teeth. This achene has been photographed, much enlarged and prints from the negative can be supplied by the Gray Herbarium. It is much larger than those shown in FIG. 10. It is closely matched by achenes of *Grimes*, no. 4546, from grassy bank by Dismal Swamp Canal, Wallacetown, Virginia. The latter plant is almost exactly duplicated by *Fernald, Long & Fogg*, no. 5136, from fresh to brackish swales of North Landing River, near Creed's, Virginia. Grimes's material, in fruit, was collected in October; the flowering material from North Landing River (distributed as *B. coronata*, var. *tenuiloba*) on September 9th. It is desirable to secure material of it in October. I wish here to express to Professor Pellegrin and Mr. Macbride my great appreciation of their help.

BIDENS **infirma**, sp. nov. (TAB. 507, FIG. 1–3), herba annua diffuse ramosa 1–2.5 dm. alta; foliis membranaceis anguste petiolatis, laminis anguste lanceolatis apice basique attenuatis, margine argute grosseque serrato-dentatis; capitulis discoideis campanulatis 7–13-floris 4–8 mm. diametro pedunculatis, pedunculis tenuibus 1–3 cm. longis; involucris glabris; bracteis exterioribus 2–4 linearibus vel lanceolatis, interioribus oblongis subacutis 5–8 mm. longis; achaeniis planis oblanceolatis apice valde rotundatis vel convexis strigosis utrinque

unicostatis, margine sparse antrorso-ciliatis, exterioribus 4–6.3 mm. longis 1–1.5 mm. latis inermibus, centralis 5.5–8 mm. longis 1–1.4 mm. latis plerumque breviter aristatis, aristis divergentibus 0.2–0.8 mm. longis antrorse setulosis. *B. heterodoxa*, var. *atheistica* Fernald in RHODORA, xxxiv. 116 (1934).—Tidal mud and slaty intertidal gravels of the St. Lawrence, Bellechasse County, Quebec: Anse St. Vallier, September 15, 1931, *Fernald*, nos. 2952, 2955 (TYPE in Gray Herb.), 2960; St. Vallier, 26 Août 1931, *Victorin, Rolland & Jacques*, no. 44,152 (as *B. Eatoni*), 1 Octobre 1932, *Victorin, Rolland & Jacques*, no. 44,116 (as *B. Eatoni*).

Bidens infirma is the little plant of the tidal flats of Bellechasse County which I described as *B. heterodoxa*, var. *atheistica*. So long as it was considered a variety of *B. heterodoxa*, with parallel varieties *orthodoxa* and *agnostica*, its varietal name had some appropriateness. For a species apart from them its original name would be quite meaningless. I have, therefore, exercised the right, treating it as a species, of giving a new name.

Bidens infirma is at once distinguished by the remarkable achenes (FIG. 3) with rounded or dome-like summits, the outer ones unarmed, the intermediate and central ones either awnless or with very short and strongly divergent upwardly barbellate awns. *B. heterodoxa* (FIGS. 4–6) has the achenes truncate at summit, as in most of our species, typical *B. heterodoxa* (FIG. 4) of Prince Edward Island and the Magdalen Islands with long ascending upwardly barbellate awns, var. *orthodoxa* (FIG. 5) of the Magdalen Islands with them retrorsely barbed. Var. *agnostica* (FIG. 6) differs from them in having the awns wholly or nearly barbless and slightly longer.

The photographs sufficiently indicate the strong specific claims of *Bidens infirma*. It is still another of the remarkable endemics of the intertidal flats of the St. Lawrence estuary.

BIDENS FRONDOSA L., forma **anomala** (Porter), comb. nov. *B. frondosa*, var. *anomala* Porter ex Fernald in RHODORA, v. 91 (1903).

For two to three decades it was thought that the plant with antrorsely barbellulate awns was essentially maritime. We now knew it to grow inland through much of the range of typical *Bidens frondosa*.

BIDENS VULGATA Greene, forma **puberula** (Wieg.) comb. nov. *B. frondosa* L., var. *puberula* Wiegand in Bull. Torr. Bot. Cl. xxvi. 408 (1899). *B. vulgata*, var. *puberula* (Wieg.) Greene, Pittonia, iv. 250 (1901). *B. puberula* (Wieg.) Rydb. Fl. Pr. Plains, 849 (1932).

Scattered through the range of typical glabrate *Bidens vulgata*, seemingly only a more pubescent form.

Photo. E. C. Ogden.

BIDENS CORONATA, VAR. BRACHYODONTA: FIG. 1, plant, × ⅖; FIG. 2, outer (broad) and central (narrow) achenes, × 4, from TYPE, Harwich, Massachussetts; FIG. 3, achenes, × 4, from Lynnfield, Massachusetts.

Var. TYPICA: FIG. 4, achenes (outer broad, central narrow), × 4, from Delaware River; FIG. 5, achenes, × 4, from Illinois.

Var. TENUILOBA: FIG. 6, achenes (outer shorter), × 4, from TYPE, Illinois; FIG. 7, achenes, × 4, from Wisconsin.

Var. TRICHOSPERMA: FIG. 8, achenes (outer broader), × 4, from Virginia; FIG. 9, achenes, × 4, from Georgia.

B. MITIS: FIG. 10, achenes, × 4, from Florida.

Photo. E. C. Ogden.

BIDENS INFIRMA: FIG. 1, portion of TYPE, × 1; FIG. 2, head, × 2; FIG. 3, achenes (shorter marginal, longest central), × 4.

B. HETERODOXA: FIG. 4, achenes, × 4, from Prince Edward Island.

B. HETERODOXA, var. ORTHODOXA: FIG. 5, achene, × 4, from Magdalen Islands.

B. HETERODOXA, var. AGNOSTICA: FIG. 6, achene, × 4, from Connecticut.

RATIBIDA COLUMNIFERA (Nutt.) Woot. & Standl., forma **pulcherrima** (DC.) comb. nov. *Obeliscaria pulcherrima* DC. Prodr. v. 559 (1836). *R. columnaris*, var. *pulcherrima* (DC.) D. Don in Sweet's Brit. Fl. Gard. ser. 2, iv. 361, pl. 361 (1838). *Lepachys columnaris*, var. *pulcherrima* (DC.) Torr. & Gray, Fl. N. Am. ii. 315 (1842). *R. columnifera*, var. *pulcherrima* (DC.) Woot. & Standl. in Contrib. U. S. Nat. Herb. (Fl. N. Mex.) xix. 706 (1915). *L. columnifera*, var. *pulcherrima* (DC.) Rydb., Fl. Prair. Pl. 838 (1932). *R. columnaris*, forma *pulcherrima* (DC.) W. M. Sharp in Ann. Mo. Bot. Gard. xxii. 70 (1935).

The necessity to make a new combination for the color-form of *Ratibida columnifera* with purple or purple-marked ligules arises through the failure of some authors to trail names to their ultimate sources. Both the generic and the specific names here involved need elucidation.

Rafinesque, with customary flexibility, had three generic names for the small American genus which, before him, had been included under *Rudbeckia*. In 1817 he published two of them, with very brief but technically sufficient and significant diagnoses and each with a previously published species of *Rudbeckia* cited as typical. In discussing segregates of *Rudbeckia* he said

"All the species with naked seeds as *R. pinnata &c.* must form my genus *Obelisteca*, and those with a simple perianthe, such as *R. columnaris* Pursh, my genus *Ratibida*. Raf."[1]

In later works Rafinesque maintained *Ratibida* and, unfortunately, many authors have dated the publication of this genus from one of the later treatments, not from the earliest publication. Thus Macbride, returning from *Ratibida* to the longer-used but really later *Lepachys*, said

"In accordance with Art. 38 of the International Rules of Botanical Nomenclature, *Lepachys* Raf. Journ. Phys. lxxxix. 100 (1819), although a later name than *Ratibida* Raf. Am. Monthly Mag. ii. 268 (1818), is retained since the latter was published "without diagnosis or reference to a former description under another name" and therefore "is not valid."[2]

And Rydberg, after using *Ratibida* for many years, dated from the American Monthly Magazine (Feb., 1818), instead of from Flora Ludoviciana (1817), swung, in his late period of conservatism, to *Lepachys* Raf. (1819), in synonymy referring to "*Ratibida* Raf., hyponym." Now, by the example of a hyponym given in the Century

[1] Raf. Fl. Ludov. 73 (1817).
[2] J. F. Macbride in Contrib. Gray Herb. n. s. no. lxv 45 (1922).

Dictionary, taken from F. S. Earle, Science, n. s. xix. 509 (March 25, 1904), "Some are *hyponyms*, never having been associated with a recognizable binomial species", it becomes clear that *Ratibida* as used by Rafinesque in 1818 was *not* a hyponym. Incidentally it should be noted that Macbride erred in stating that Rafinesque in 1818 gave no reference to a former description. Rafinesque was reviewing Pursh's Flora (1814) and in so doing took the opportunity to rename many of the species and genera. Of Pursh's *Rudbeckia columnaris* he said "125. *Rudbeckia columnaris* must form the genus *Ratibida* of Raf. fl. Miss."[1] *Ratibida* at this point had no diagnosis but it certainly was "associated with a recognizable binomial." Incidentally, Rafinesque referred back to an earlier publication. To be sure he called it "fl. Miss.", instead of Flora Ludoviciana, but that was a mild error for him! As already noted, in the latter work (1817) the genus was passably set forth and the objections to it arising from starting with 1818 disappear. Dr. W. M. Sharp has properly reinstated *Ratibida* in his study of the genus.[2]

In the same paper Sharp, however, rejects the first published specific name *Rudbeckia columnifera* Nuttall in Frasers' Cat. no. 75 (1813), and retains the long-used but later *R. columnaris* Sims in Curt. Bot. Mag. xxxix. plate 1601 (1814), Sharp giving the date of the latter as "1813." In regard to the date he does not state why he credits *R. columnaris* to 1813. The title-page distinctly says 1814. Presumably the new interpretation of date arose through the fact that plate 1601, like plates 1600 and 1602–1605, has the engraver's date "Dec. 1, 1813," while plates 1592–1599 are dated by the engraver "Nov. 1, 1813." The dates of the engravings, I take it, do not mean that these plates with their accompanying text were issued to the public on November 1 and December 1 respectively. The text with them indicates that they were issued considerably later.

Pursh's Flora Americae Septentrionalis, with the Preface dated "*December* 1813," was published in 1814, and in it he repeatedly cited plates in the Botanical Magazine prior to vol. xxxix. In the latter volume 4 North American species were originally described and also illustrated with the engraver's date "Nov. 1, 1813." These were *Oenothera missouriensis* (pl. 1592), *O. caespitosa* (pl. 1593), *Tradescantia subaspera* (pl. 1597) and *Helonias graminea* (pl. 1599); yet not

[1] Raf. in Am. Month. Mag. ii. 268 (Feb., 1818).
[2] W. M. Sharp in Ann. Mo. Bot. Gard. xxii. 62 (1935).

one of them was mentioned by Pursh in 1814. *Rudbeckia columnaris* (pl. 1601) was independently described by Pursh under that name, but with no reference to the account by Sims and the plate, Pursh renaming the earlier *R. columnifera* Nuttall in Frasers' Catalogue, which he cited. Added to the fact that Pursh nowhere cited any of the descriptions and plates in Bot. Mag. xxxix. we have the striking circumstance that, in the text accompanying the plates of other but previously published North American species, dated by the engraver "Nov. 1, 1813" or "Dec. 1, 1813," Pursh's Flora, even to exact page and plate, was regularly cited (see *Lophiola aurea*, pl. 1596; *Sabbatia calycosa*, pl. 1600; *Galardia bicolor*, pl. 1602). It should be clear, then, that *Rudbeckia columnaris* Sims did not antedate *R. columnaris* Pursh.

With the date of publication of *Rudbeckia columnaris* as well settled as is possible without full knowledge of the exact month and day of issue, the proper name for the species must be considered. Sharp, in the paper mentioned, sees no difficulty about taking up the generic name as sufficiently defined by Rafinesque's brief phrase of 1817; but he balks at using the first specific epithet for the species in hand, saying (l. c. 62, 63):

"The name *Rudbeckia columnifera* Nutt. was first published in "Fraser's Catalogue" in 1813. The description accompanying it is so indefinite that the name *R. columnifera* may be regarded as a *nomen subnudum*. Nuttall himself in the "Genera of North American Plants" in 1818 abandoned his name *R. columnifera* and recognized *Rudbeckia columnaris* Pursh."

The fact that Nuttall abandoned the name in 1818 is not significant, nor is it universally felt that Nuttall's original diagnosis of 1813 is not intelligible. Here it is:

"75 *Rudbeckia columnifera. ‡ Spontaneous varieties of this plant sometimes occur with bright fulvous flowers, colored like *Tagetes patula;* the stem is simple, seldom producing more than three flowers, which are of an uncommon length, appearing like a column of flosculi, subtended by 5–8 neutral florets, and a simple calyx."[1]

Certainly this is a far more intelligible diagnosis of a species than was the original characterization of *Ratibida* for a genus! Wooton & Standley, Macbride and Rydberg have all found it distinctive and, even if it seem to some only a "*nomen subnudum*" in spite of the three distinctive characters given, it should be noted that the name

[1] Nuttall in Frasers' Cat. no. 75 (1813).

Rudbeckia columnifera was understood by Pursh when, in 1814, he cited it without qualification as an exact synonym of his newly proposed *R. columnaris*. The name *R. columnaris* Pursh, Fl. Am. Sept. 575 (1814), with "R. columnifera, *Fraser catal.* 1813" definitely cited as the same, was, consequently, in part an illegitimate (or substitute) name for *R. columnifera* and to that extent it cannot be maintained!

There is no question about the plant which Nuttall described in Frasers' Catalogue. It was grown in the Frasers' garden from seed supplied by Nuttall; and in the year following Frasers' Catalogue it was published as *Rudbeckia columnaris* Sims in the Botanical Magazine, with a beautiful plate of the common yellow-rayed plant. The Sims plant "was introduced, we believe, by Mr. NUTTALL, from the country of the Missouri; our drawing was taken at the Nursery of Messrs. J. and J. T. FRASER." *Rubdeckia columnifera* Nuttall (1813) and *R. columnaris* Sims (1814) were, then, based on the same material; the name *R. columnaris* Pursh (1814) was, in part at least, an illegitimate substitute for *R. columnifera.*

Only one other name is available for the yellow-rayed plant. This is *Ratibida sulcata* Raf. Journ. de Phys. lxxxix. 100 (1819); but that, too, was a substitute-name: "Son type est la *Rudbeckia columnari*[*s*] de Pursh, qui devra s'appeller *Ratibida sulcata.*"

CACALIA **Muhlenbergii** (Sch. Bip.), comb. nov. *C. reniformis* Muhl. in Willd. Sp. Pl. iii[3]. 1735 (1804), not Lam. Fl. Fr. ii. 75 (1778). *Senecio Muhlenbergii* Schultz Bip. in Flora, xxviii. 499 (1845). *Mesadenia Muhlenbergii* (Sch. Bip.) Rydberg, Fl. Pr. Pl. 873 (1932).

In 1921 House, citing *Cacalia reniformis* as published in Willdenow's Species, vol. "73: 1753" (instead of vol. 3, pt. 3, p. 1735), pointed out that the name is invalidated by *C. reniformis* Lam. (1778). He, therefore, made for it the new combination *C. rotundifolia* (Raf.) House, N. Y. State Mus. Bull. nos. 233–234: 67 (1921), based upon *Mesadenia rotundifolia* Raf. New Fl. iv. 79 (1838), without discussion of what Rafinesque may have had.[1] As to the latter question, it is significant that *C. reniformis* Muhl. is a tall plant (4–9 ft.—*Gray*, Syn. Fl.; 0.9–3 m.—*Small;* 1–3 m.—*Rydberg*); that it has the leaves green on both sides (though paler beneath) as contrasted with the glaucous

[1] Incidentally, those who, like Small and Rydberg, have taken up for one section of *Cacalia* L. the name *Mesadenia* Raf. (1832 and 1838) pass over the fact that in 1828 Rafinesque had attempted to substitute an earlier *Mesadenia* Raf. Med. Fl. i. 198 (1828) for *Frasera* Walt. of the *Gentianaceae.* For *Mesadenia* Raf. (*Compositae*) the proper generic name, for those who consider it a genus, seems to be *Conophora* (DC.) Nwd. in Am. Midl. Nat. iii. 193 (1914).

foliage of *C. atriplicifolia* L., the lower ones very large ("often 2 feet wide"—*Gray*, Syn. Fl.; "10–60 cm. wide"—*Small;* "1–2.5 dm. wide" —*Rydberg*) and abundantly dentate, the cauline distinctly petioled. Rafinesque's *Mesadenia rotundifolia* was "2 or 3 feet high," with leaves "entire or repand glaucous beneath . . . lower . . . 3 or 4 inches long and broad . . . upper sessile." It is most probable that *Mesadenia rotundifolia* Raf. had nothing to do with *Cacalia reniformis* Muhl.; *Index Kewensis* even refers it to *Vernonia!* Had Dr. House, before publishing the combination *C. rotundifolia* (Raf.) House (1921), consulted the latter indispensible work he would have found that an Indian species was published as *C. rotundifolia* Willd. Sp. Pl. iii³. 1732 (1804), in the same treatment in which *C. reniformis* Muhl. was first described. Even if it is possible to guess what Rafinesque may have had, the name *C. rotundifolia* (Raf.) House (1921) is clearly antedated by *C. rotundifolia* Willd. (1804).

Explanation of Plates 497–507

Plate 497. Panicum recognitum, sp. nov.: fig. 1, type, × ½, from Albion, New Jersey, *Long*, no. 7671; fig. 2, base of cauline leaf, × 1, from the type; fig. 3, pubescence of sheath, × 10, from type; fig. 4, node, × 10, from type; fig. 5, pulvinus and base of panicle-branch, × 10, from type; fig. 6, spikelets, × 10, from type.

Plate 498. Panicum recognitum, sp. nov.: plant, × ½, showing autumnal branching, from type-station, *Long*, no. 4944.

Plate 499. Asarum canadense, forma Phelpsiae, f. nov.: type, × 1, from Gouverneur, New York, *Orra Parker Phelps*, no. 1143.

Plate 500. Agrimonia striata Michx.: fig. 3, fruit, × 8, from Franklin, Connecticut, October 2, 1906, *R. W. Woodward.*

A. striata, var. campanulata, var. nov.: fig. 1, plant, × 3/8, from Rincon Mountains, Arizona, *Blumer*, no. 3384; fig. 2, fruit, × 8, from Ramsey Cañon, Huachuca Mountains, Arizona, *Marcus E. Jones*, no. 24,920 (type).

Plate 501. Polygala verticillata L.: fig. 1, one of the two plants in the Linnean Herbarium, type of the species, × 1, courtesy of *Mr. Spencer Savage.*

Var. isocycla, var. nov.: fig. 2, one of several plants, × 1, from Frazer, Pennsylvania, *E. B. Bartram*, no. 1124 (type); fig. 3, raceme, × 4, of the type, to show fruit.

Var. sphenostachya Pennell: fig. 4, raceme, × 4, from Swope Park, Missouri, *Bush*, no. 7692 (isotype), to show fruit.

Plate 502. Sufficiently explained on p. 341.

Plate 503. Hackelia americana (Gray) Fernald: fig. 1, portions of a plant, × 1, from Burnt Bluff, Delta County, Michigan, *Fernald & Pease*, no. 3492; fig. 2, expanded flower, × 4, from no. 3492; fig. 3, fruiting branch, × 1, from Percé, Quebec, *Collins, Fernald & Pease* (*Pease*, no. 5482); fig. 4, fruiting branch, × 1, also from Percé; fig. 5, fruit, × 8, from same plant as fig. 3; fig. 6, separated nutlet, × 8, showing prickles on back, from Mackinac Island, Michigan, August 4, 1910, *J. R. Churchill.*

Plate 504. Hackelia deflexa (Wahlenb.) Opiz: fig. 1, portions of plants, × 1, from Torne Lappmark, *Alm* (Intern. Phytogeogr. Exc., 1925, no. 6285); fig. 2, fruiting branch, × 1, from the Altai, *B. K. Schishkin;* fig. 3, portions of racemes, × 1, from Bohemia, *Petrak*, Fl. Bohem. Morav. Exsicc., Lfg. V. no.

484; FIG. 4, flower, × 4, from same collection as FIG. 1; FIG. 5, fruit, × 8, from Songaria, *Schrenk;* FIG. 6, fruit, × 8, from above Zermatt, Switzerland, *Wilczek;* FIG. 7, separated nutlet, × 8, from Norland, Norway, *Ove Dahl.*

H. VIRGINIANA (L.) I. M. Johnston: FIG. 8, fruit, × 8, from Newton, Massachusetts, September 5, 1897, *E. F. Williams.*

PLATE 505. ERIGERON ELATUS Greene: FIG. 3, head × 2, from Carbon River, British Columbia, *Raup & Abbe*, no. 4270a.

E. ELATUS, var. OLIGOCEPHALUS (Fernald & Wiegand) Fernald: FIG. 1, one of the TYPE-SPECIMENS, Blanc Sablon, Labrador, *Fernald & Wiegand*, no. 4138; FIG. 2, head, × 2, from TYPE.

E. ELONGATUS Ledebour: FIG. 4, head, × 2, from Tracadigash Point, Carleton, Quebec, *Fernald & Weatherby*, no. 2472.

E. ACRIS L.: FIG. 5, head, × 2, from Mähr-Weisskirchen, Bohemia, *Petrak*, Fl. Bohem. Morav. Exsicc. Lfg. I, no. 92.

E. BOREALIS (Vierh.) Simmons: FIG. 6, head, × 2, from Jämtland, Sweden, July 15, 1934, *Nannfeldt.*

PLATE 506. BIDENS CORONATA (L.) Britton, var. BRACHYODONTA, var. NOV.: FIG. 1, plant, × 2/5, from Chebacco Lake, Essex, Massachusetts, *Fernald, Hunnewell & Long*, no. 10,690; FIG. 2, outer (broad) and central (narrow) achenes, × 4, from the TYPE, Harwich, Massachusetts, *Fernald*, no. 17,613; FIG. 3, achenes, × 4, from Pilling Pond, Lynnfield, Massachusetts, October 21, 1917, *Fernald.*

Var. TYPICA: FIG. 4, outer (broad) and central (narrow) achenes, × 4, from Delaware River, "New Jersey, near Philada.," *A. Gray;* FIG. 5, achenes, × 4, from Peoria, Illinois, 1869, *Stewart.*

Var. TENUILOBA (Gray) Sherff: FIG. 6, outer (broader) and central achenes, × 4, from one of the original sheets, Peoria. Illinois, 1869, *Stewart;* FIG. 7, achenes, × 4, from Buffalo Lake, Montello, Wisconsin, *Fassett*, no. 8964.

Var. TRICHOSPERMA (Michx.) Fernald: FIG. 8, outer (broad) and central (narrow) achenes, × 4, from south of Swann Point, Virginia, *Fernald & Long* no. 6909; FIG. 9, achenes, × 4, from Satilla River near Woodbine, Georgia, *Harper*, no. 1562.

B. MITIS (Michx.) Sherff: FIG. 10, outer (broader) and central achenes, × 4, from Leavy County, Florida, November, 1877, *Garber.*

PLATE 507. BIDENS INFIRMA, sp. nov.: FIG. 1, portion of TYPE, × 1, from Anse St. Vallier, Quebec, *Fernald*, no. 2955; FIG. 2, head, × 2; FIG. 3, achenes (shortest marginal, longest central), × 4.

B. HETERODOXA (Fern.) Fern. & St. John: FIG. 4, achenes, × 4, from Southport, Prince Edward Island, *Fernald, Long & St. John*, no. 8205.

B. HETERODOXA, var. ORTHODOXA Fernald & St. John: FIG. 5, achene, × 4, from Alright Island, Magdalen Islands, *Fernald, Long & St. John*, no. 8204.

B. HETERODOXA, var. AGNOSTICA Fernald: FIG. 6, achene, × 4, from Pocotapaug Lake, Chatham, Connecticut, *Fassett*, no. 2369.

CYPERUS OXYLEPIS IN THE UNITED STATES AND MEXICO.—*Cyperus oxylepis* Nees is cited in the literature as occurring in the West Indies and South America. Apparently there are no records from the United States and Mexico. The following specimens are cited as probable records for this species.

Standley 879. "Island off Aransas Pass, Aransas Bay," Texas, May 24, 1922. *Brandegee.* Guaymas, Sonora, Mexico. University California Herbarium. Number 200,897. November 11, 1893. *Deam, Charles.* 104. Salina Cruz, Mexico, December 21, 1898. *Rose,*

Standley and Russell 13,861. Salt flats, Sinaloa, Mazatlan, Mexico. April 1, 1910.—Hugh O'Neill, Langlois Herbarium, Catholic University of America, Washington, D. C.

A New Variety of Polygonum from Washington.—Polygonum Newberryi Small, Bull. Torr. Club **21**: 170, 1894, occurs in the Cascade Mountains of Washington and Oregon and the Sierra Nevada of northern California; also it has been collected in the Olympics and in the Wenatchee Mountains of Washington. Its type-locality is Crater Pass, southern Oregon, where it was discovered by Dr. Newberry in 1856. Throughout most of the range of this species the plants are finely pubescent. However, specimens from the Olympics, and from the Wenatchee range, are uniformly glabrous. Dr. Small's original description included both pubescent and glabrous plants. Since the glabrous plants have a restricted geographical distribution and probably constitute a distinctive biotypic unit they are here proposed as:

Var. **glabrum**, var. n., planta tota glaberrima, caetera cum forma typica congruentia.

Specimens examined. Washington: Olympic Mountains: Seven Lakes Basin, *Jones* 8322 (type); Wenatchee Mountains: Mount Stuart region, *J. W. Thompson* 5830; Beverly Creek, Kittitas Co., *J. W. Thompson* 6846, 8760, 9597; Mountains, Washington Territory (without definite locality), *Brandegee* 1066.

These plants differ, *inter alia*, from *P. Davisiae* Brew. of California, by the petiolate, usually broader leaves.—George Neville Jones, Gray Herbarium, Harvard University.

Moss Flora of North America.—With the recent appearance of volume 1, part 2,[1] this work is now three-quarters completed. This latest section takes up the Dicranaceae (partly treated in part 1), Leucobryaceae, Polytrichaceae and Calymperaceae, and describes a total of 101 species. Most of these species are represented by figures, largely transcribed from other works but including original illustrations for 16 species by Dr. Seville Flowers and for 8 others by Dr. W. S. Steere. The genera treated are as follows: (Dicranaceae) *Angstroemia*, *Rhabdoweisia*, *Oreoweisia*, *Dichodontium*, *Oncophorus*, *Symblepharis*, *Dicranoweisia*, *Arctoa*, *Dicranum*, *Dicranodontium*, *Campylopus*, *Brothera* and *Paraleucobryum;* (Leucobryaceae) *Octoblepharum* and *Leucobryum;* (Polytrichaceae) *Atrichum*, *Oligotrichum*, *Lyellia*, *Polytrichadelphus*, *Pogonatum* and *Polytrichum;* (Calymperaceae) *Calymperes* and *Syrrhopodon*. One new variety is described and there are 8 new species-combinations and 12 new varietal combinations. The text for the Polytrichaceae is contributed

[1] Moss flora of North America, north of Mexico, by A. J. Grout. Vol. 1, part 2, pp. 63–135, pls. 39–68. August, 1937.

by Dr. T. C. Frye; for the Calymperaceae by Dr. Steere. For the Polytrichaceae attention should be called to several published extensions of range which Dr. Frye apparently has overlooked, as follows. *Pogonatum brachyphyllum* (Rich.) Beauv., northern limit given as New Jersey, has been recorded from Connecticut[1] and also collected by Latham in eastern Long Island (specimens in Yale herbarium); *Pogonatum capillare* (Rich.) Brid., eastern range given as "Greenland to Newfoundland and New York, southward to North Carolina," has been recorded from northern Michigan, where it grows along the south shore of Lake Superior.[2] *Pogonatum alpinum* (Hedw.) Roehl., described as ranging "southward to Newfoundland, New Hampshire, Vermont, New York . . . ," has been recorded from northwestern Connecticut.[3] Incidentally, while it is accredited to this State by Dr. Frye, the writer has been unable to locate any Connecticut specimens of *Polytrichum gracile* Sm.—G. E. NICHOLS.

[1] RHODORA **12**, p. 153. 1910.
[2] Bryologist **36**, p. 77. 1933.
[3] Connecticut Geol. & Nat. Hist. Surv. Bull. No. 11, p. 175. 1908.

Volume 40, no. 476, including pages 281–324 and plates 494–496, was issued 1 August, 1938.

OCT 18 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. October, 1938. No. 478.

CONTENTS:

On the Occurrence of Crotalaria spectabilis in Southeastern Missouri. *Mary Maxine Larisey* 361

Noteworthy Plants of Southeastern Virginia. *M. L. Fernald* 364

An unexpected Addition to the Flora of Western Massachusetts. *George J. Wallace* 424

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

CROTALARIA SPECTABILIS

Specimen No. 1122087 in Herbarium of Missouri Botanical Garden

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. October, 1938. No. 478.

ON THE OCCURRENCE OF CROTALARIA SPECTABILIS IN SOUTHEASTERN MISSOURI

Mary Maxine Larisey

(Plate 508)[1]

From the collections of Mr. John Henry Kellogg, the Herbarium of the Missouri Botanical Garden recently acquired a specimen of an exotic *Crotalaria* which has been observed with increasing frequency in the southeastern lowland region of Missouri during the past few years. Further investigation has disclosed the fact that its use as a silage plant in that area has been extended by farmers who purchase seed on the market under the name *Crotalaria retusa* L. Careful study of descriptions and comparison with authentic specimens of *C. retusa* L., however, revealed a number of contrasting characters for which ample provision appeared to be made in descriptions of *C. spectabilis* Roth, a closely allied species resembling the former in general habit sufficiently to explain the confusion which has arisen between them. Both entities have apparently been included within *C. retusa* L. by some authors, for *C. spectabilis* Roth has not been listed in many of the Manuals of regions from which it has been reported. Furthermore, *C. retusa* L. has been commonly utilized as a cover plant, particularly in Florida and throughout the South, which might further account for the misnomer now under discussion. A statement of the most obvious distinctions between the two species is perhaps advisable at this point:

[1] Expense of illustration defrayed by the author.

C. spectabilis Roth	C. retusa L.
1. Plant 5–18 dm. tall	1. Plant 4–9 dm. tall
2. Leaves frequently mucronate	2. Leaves rounded or retuse
3. Stipules ovate-cordate, broadened at the base, persistent	3. Stipules subsetaceous, caducous
4. Bracts cordate-lanceolate, subsagittate, persistent	4. Bracts minute, caducous
5. Flowers somewhat smaller, 15–20 mm. long, standard 15–20 mm. broad	5. Flowers large, 17–23 mm. long, standard, usually 20–25 mm. broad

In the course of his studies on the East Indian collections of Dr. Benjamin Heyne, A. W. Roth proposed the name *C. spectabilis*, supplanting an earlier name, *C. sericea* Retz, based on the collections of Dr. J. G. Koenig in the East Indies, but which was invalid, having been previously applied to another species of *Crotalaria* by Burmann. Four authentic specimens of *C. sericea* Retz in the Herbarium of the Missouri Botanical Garden confirmed the identity of Mr. Kellogg's plant with which they coincided in every detail.

The adaptation of this species in Missouri takes on added interest with the realization of its center of distribution which is in India proper and the East Indies. It occurs also in the Hawaiian Islands, and throughout the West Indies which have undoubtedly provided the avenue for its entry into Florida along with many other species whose closest affinities are now found in the Bahama Islands. *C. retusa* L. has virtually the same distribution and has become established in Florida through the same channels. Both species have been cultivated extensively and have frequently run wild. Since the southeastern lowlands of Missouri constitute an extension of the coastal plain and possess many elements of the coastal vegetation, the ease with which this species is becoming acclimated is perhaps not so strange as it is interesting. That it will become an established unit of vegetation is highly probable for it has already escaped from cultivation in a number of instances along roadsides, and scattered clumps are known to be thriving in at least one old field which has lain idle for several years. What success it will have in invading other parts of the state is unpredictable; however, its possibilities are being demonstrated. A large, sturdy plant bearing a profusion of beautiful yellow flowers in long, terminal racemes, it has captured interest in horticultural circles and has been grown with apparent success in several gardens in the vicinity of St. Louis—a region bordered by the northern limits of the Ozark plateau and which sustains a totally different flora from that of the southeastern lowlands. Professor

Fernald writes me that the species is now appearing, also, in eastern Virginia.

A description and brief bibliographical treatment of the species follows:

CROTALARIA SPECTABILIS Roth, A. W., Nov. Pl. Ind. Orient. 341. 1821; DC., Prodr. **2**: 125. 1825; Small, Fl. Southeast. U. S., ed. 1, 602. 1903, and ed. 2, 602. 1913. *C. sericea* Retz, A. J., Obs. Bot. Pt. 5. 26. 1779–91, not Burm., Fl. Ind. 156. 1768; Willd., Sp. Pl. **3**: 975. 1803; DC., Prodr. **2**: 126. 1825; Wallich's Cat. No. 5406. 1828; Roxburgh, Fl. Ind. **3**: 273. 1832; Wight and Arnott, Prodr. Fl. Pen. Ind. Orient. **1**: 186. 1834; Hooker, Fl. Br. Ind. **2**: 75. 1879; Fawcett and Rendle, Fl. Jam. **4**: Pt. 2. 10. 1920. *C. sericea* Willd., Sp. Pl. **3**: 975. 1803; Roxburgh, Fl. Ind. **3**: 273. 1832. *C. cuneifolia* Schrank in Syll. Nov. Pl. Ratisb. **2**: 78. 1828; Hooker, Fl. Br. Ind. **2**: 75. 1879. *C. macrophylla* Weinm. in Syll. Nov. Pl. Ratisb. 26. 1828; Hooker, Fl. Br. Ind. **2**: 75. 1879. *C. Retzii* Hitchcock, A. S., Rept. Mo. Bot. Gard. **4**: 74. 1893; Fawcett and Rendle, Fl. Jam. **4**: Pt. 2. 11. 1920; Small, Man. Southeast. Fl. 679. 1933.—Plant 5–18 dm. tall, canescent, finely pubescent; stem stout, scabrous, erect, obtuse-angled, branches alternate, erect-spreading; leaves simple, short-petiolate, cuneate, obovate, or oblong-elliptic, uppermost frequently sublinear, 3–9 cm. long, 1–4 cm. broad, mucronate, tomentose-canescent below, darker green, often glabrous above; stipules ovate-cordate to cordate-lanceolate, semiamplexicaul, persistent; racemes terminal, loose, 1.5 to 4.5 dm. long; pedicels slender, 5–10 mm. long, subtended by cordate-lanceolate, acuminate, subsagittate, persistent bracts; calyx glabrous, lobes slightly longer than the tube, those of the upper lip triangular-lanceolate, of the lower lip lanceolate; corolla yellow, standard 15–20 mm. long, 15–20 mm. broad; ovary glabrous, mature pod shortly pedicellate, ovoid-oblong, inflated, 3–5 cm. long, spreading or drooping.

Distribution: India, the Hawaiian Islands, East and West Indies. Introduced in North America: Florida, eastern Virginia, southeastern lowlands of Missouri.

MISSOURI: along Highway 25 in an old field between Kennett and Holcomb, Dunklin Co., Sept. 10, 1937, *Kellogg* (MBG); fields and roadsides near Charleston, Mississippi Co., Oct. 15, 1937, *Kellogg* (Herb. J. H. Kellogg).

HENRY SHAW SCHOOL OF BOTANY,
WASHINGTON UNIVERSITY, St. Louis.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXIII

NOTEWORTHY PLANTS OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(Plates 509–535)

Part I. Itinerary of Four Field-trips

Renewing[1] our studies of the Coastal Plain of southeastern Virginia, again with our center at the Biological Laboratory of the University of Richmond, where we enjoyed the cordial and renewed hospitality of Professors Bailey and Smart and their associates and again had the efficient help of Mr. Carroll Williams, my companion in the Virginia work, Mr. Bayard Long, and I endeavored to start with the flora in spring and to keep interruptedly abreast with it until late autumn in 1937. The spring was not an advanced one but in early April (3–9) we collected more than 150 species in the area bounded by the outer Piedmont (along automobile Route 1) and the Dismal Swamp—at least 5 of the species new to Virginia, some (like *Draba brachycarpa* and *Sedum Nevii*) at probably their southeastern limits in the state, and still others (*Arabis virginica*, *Viola hirsutula*, *Obolaria virginica*, *Phlox nivalis* and *Plantago heterophylla*) certainly very local or rare in the area. We were induced to enter the Piedmont in southwestern Dinwiddie, northwestern Brunswick and southeastern Mecklenburg Counties because friends who are ordinarily keen observers had reported extensive sandy pine barrens in the last county, along Route 1. The ubiquitous heavy red clay and the ledges along the streams were, however, so unlike sandy pine barren that their report was obviously based on observations along some other route; possibly Route 158. Along the latter road, in eastern Southampton County, from about six miles south of Franklin to the Nottoway at Smith's Ferry, there occurs a considerable extent of pineland (in some places quite as defi-

[1] For preceding studies see Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189 (1935)—Contrib. Gray Herb. no. CVII; Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413 and 423–554 (1935)—Contrib. Gray Herb. no. CIX; Fernald, *Plants from the Outer Coastal Plain of Virginia*, Rhodora xxxviii. 376–404 and 414–452 (1936)—Contrib. Gray Herb. no. CXV; *Local Plants of the Inner Coastal Plain of Southeastern Virginia*, Rhodora, xxxix. 321–366, 379–415, 433–459 and 465–491 (1937)—Contrib. Gray Herb. no. CXX.

nitely sandy pine barren as the area in Isle of Wight County), an area which, later in the year, gave us many surprises. On our last day in the field in early April we found our car bogged in particularly "slick" mud of the always "slippery when wet" Miocene clay, on a side-road. I undertook my part in attempting to lift the car out but, weakened by a severe attack of the grippe from which I had not wholly recovered, I strained my heart to such an extent that I was laid aside for repair and it was September (6–20) before I could renew the Virginia work. Long was with me and Carroll Williams, fortunately, could drive us and help us. I was, most happily, the personal guest during this trip of Dean and Mrs. Raymond B. Pinchbeck, whose true hospitality allowed me to go and come at all hours.

In 1886 the late Lester F. Ward stated that *Sabatia lanceolata* "was collected near Ashland, about seventeen miles north of Richmond. It was seen at one or two more southerly points";[1] and Merriman cites it from "Low pine lands" in his *Flora of Richmond and Vicinity*. We had never met this very characteristic species, now known as *S. difformis* (L.) Druce, anywhere in the state. In fact, it is not represented in the Gray Herbarium from between its northern limit, in southern New Jersey and Delaware, and eastern North Carolina; nor is it listed for Maryland and the District of Columbia. Our first day's exploration, in pouring rain, was, consequently, about Ashland and adjacent areas. The modern automobile route does not always follow the old road of Ward's time; at least we did not find *Sabatia difformis* nor any Coastal Plain types of note. We were in the border of the Piedmont and drove north as far as Milford in Caroline County, but the really noteworthy records were few, although *Sanicula Smallii* Bicknell, cited by Small (Man.) as occurring northward only to North Carolina, was in rich woods near Gum Tree, and the Asiatic *Celastrus orbiculatus* Thunb. grew in a dense tangle with native *Smilax* south of Milford. After this rather fruitless day to the north and at the edge of the Piedmont we stuck very faithfully to the Coastal Plain from Dinwiddie County to the North Carolina line, thence eastward to Nansemond, with an afternoon on the Peninsula of Virginia (Grimes's territory). As in April, the bottomlands of all the rivers were drowned, so that these rich habitats, upon which we had so much counted, were essentially inaccessible, though we did reach a few spots on the uppermost terraces and there added to the Coastal

[1] L. F. Ward, *Notes on the Flora of Eastern Virginia*, Bot. Gaz. xi. 36 (1886).

Plain flora such species of the interior as *Spiranthes ovalis* and *Solidago arguta*.

The pinelands and pine barrens, which we had seen south of Franklin in April, naturally soon attracted us. Here species which had previously been known in Virginia only at our station in Isle of Wight County were found: *Quercus laevis* the common oak; and *Stillingia sylvatica* and *Carphephorus bellidifolius* both abundant. The outer coastal sands of Princess Anne County were at once suggested by the abundance of *Triplasis purpurea*, *Panicum Commonsianum*, *Cyperus filiculmis* var. *oblitus* and *Quercus cinerea* (heretofore known in the state only on the dunes of Cape Henry). *Phlox nivalis*, unusually large, was locally abundant, here about 25 miles east of the eastern-most Viriginia station of Wherry;[1] *Asimina parviflora*, in fruit, was scattered; and much of the *Trichostema dichotomum* was the southern var. *puberulum* (heretofore known in the state only from Norfolk County). *Tradescantia rosea*, var. *graminea* (*Cuthbertia graminea* Small), locally very abundant, was new to the Virginia flora, as was *Stenophyllus ciliatifolius*, growing with it; and singular plants in *Desmodium* (Plate 523) and *Sanicula* (Plate 527) prove to be undescribed varieties. For many years *Chrysopsis gossypina* has been credited to Virginia, but I recently pointed out that I have seen no vouchers for the record; and Small, in his Manual, queried its occurrence so far north. We were, consequently, delighted, at the best station of *Phlox nivalis*, to walk into an extensive colony of something related to *Chrysopsis gossypina*. It proves, however, to be quite distinct from it in technical characters of achene, corolla and involucre and is evidently an endemic and undescribed species (Plate 531, figs. 1–4).

In our previous trips on the main road from Petersburg to Suffolk we had concentrated on a stretch of pineland northwest of Waverly. This time, noticing that the pineland immediately east of the town was partly unspoiled, we tried it and were rewarded by the discovery of a really extensive station of *Hypericum setosum*, with gigantic *Liatris spicata*, a plant of the interior, in Virginia and the Carolinas often on the higher mountains, but unrepresented in the Gray Herbarium as a pine-barren species except at the south, from Florida to Wilmington, North Carolina. With it, new to Virginia, was the large extreme of *Polygala cruciata* (var. *cuspidata* (H. & A.) Wood), the plant treated by Small as *P. ramosior* ("Fla. to La. and N. C.").

[1] Wherry in Bartonia, No. 11: 12, 13 (1929).

In southeastern Virginia *Oxypolis rigidior* is somewhat localized and apparently often an indicator of good pine-barren bog. Consequently when, just outside the town of Wakefield, we saw it in a small boggy depression we shouted for Carroll to stop. There was perhaps an acre of sphagnous depression, bordered on one side by low woods, on another by the road and on a third by a rapidly encroaching cultivated field. The bog cannot hold out much longer against destruction by man; in fact, the broadening of the road now going on is taking an important slice of it. With the obliteration of this bog there will be destroyed colonies of such great rarities as *Ctenium aromaticum* (we know only three colonies), *Dioscorea hirticaulis*, *Cleistes divaricata* and *Sarracenia purpurea* var. *venosa*. The destruction will also include our first colony in the state of *Erianthus compactus* and the first colony known north of North Carolina of *Paspalum praecox* var. *Curtisianum* (*P. lentiferum*).

We had never found southeastern Nansemond County, immediately west of the Dismal Swamp, of great botanical interest and Kearney's report gives few specialties from that region, though central and western Nansemond, from the region of Whaleyville to the Blackwater is less ordinary. Perhaps we have not found the best spot; but upon the collecting-paper containing, as representative of the meagre flora, a *Panicum* or *Paspalum* fully mature but only 2 cm. high, Long expressed his emotions by writing "Sacred to the memory of Baines Hill School." But this half of Nansemond has, in reality, some really interesting plants; the difficulty is getting to them over the usually too "slick" back-roads. *Carphephorus tomentosus*, remarkably large and showy (up to 7.5 dm. high, with 40 blazing-purple heads) was frequent in wet pineland both east and west of Whaleyville. *Desmodium rhombifolium* was almost common; in one flooded cypress swamp we got typical *Potamogeton capillaceus*, new to Virginia; and in the border of dry woods northwest of Whaleyville we got a strange new *Lespedeza* (PLATE 424), looking like *L. hirta*, but with the technical characters of *L. capitata*.

In June, 1904, Dr. R. M. Harper observed from the moving train "on the Seaboard Air Line, . . . seven miles below Petersburg, a colony (containing probably several hundred individuals) of *Sarracenia flava* . . . the plants seemed to be growing in a sort of meadow, just as I have seen them in North Carolina."[1] Since *Sar-*

[1] R. M. Harper: *Sarracenia flava in Virginia*, Torreya, iv. 123 (1904).

raccnia flava is an indicator of good things we hoped that this station would yield some novelties.

Computation showed that the area must be about a mile north of the Burgess railroad station; but the maps and our own exploration indicated no feasible approach except by walking up the track. Accordingly, when I felt that I was sufficiently toughened to undertake two miles of walking over railroad ties, we started for Burgess station. Shortly before reaching there we stopped at sight of a natural spring-fed pond with quaking sphagnous border, a very rare type of pond in southeastern Virginia. But there were conspicuous signs, "Private; keep out." These were a blight to our enthusiasm, but a comfortable old house crowned the slope to the south of the pond and we went there for permission. The colored attendant could give no authority for our botanizing; the owner had gone into Petersburg for the afternoon. There was nothing to do but assume a welcome! So, forgetting Harper's meadow, we waded and tumbled in the cold water until late afternoon, when it seemed the part of wisdom to go toward Burgess. The pond was covered with *Nuphar fluviatile* (a considerable extension northward), *Brasenia Schreberi,* the first we had got on the Coastal Plain of Virginia, and a naturalized water lily with roseate petals, the European *Nymphaea alba* forma *rosea,* introduced, we later learned, only a few years ago as four or five rhizomes but now crowding everything else. *Potamogeton* presented a puzzle and *Juncus repens,* extending its long submersed branches far out from the margin, baffled us until we traced it back to fruiting plants near shore. The boggy margin had nothing absolutely new to us but it was a pleasure to extend the local ranges of such rare plants as *Agrostis elata, Xyris ambigua* and *X. torta* var. *macropoda* and *Solidago graminifolia* var. *polycephala.* At last, fearing the return of a ferocious owner, we proceeded south. The old Burgess millpond was filled, at least near its outlet, with the relatively gigantic *Anacharis densa,* which, north to New York, occasionally spreads from aquaria but rarely becomes naturalized; here it had full possession.

The railroad, with its high embankments and its culverts, has nearly ruined the *Sarracenia flava* area north of Burgess Station. Only a few dilapidated plants persist, though the peaty and springy slopes and depressions furnished new stations for such nice things as *Rhynchospora cymosa* var. *globularis, Rhexia mariana* var. *purpurea* (*R. Nashii* Small), and *Eupatorium leucolepis.* Near-by, in dry pine

woods, was our first station south of Cape Charles and the Williamsburg region for *Gnaphalium obtusifolium* var. *micradenium;* and near it was *Silphium compositum* var. *reniforme* (*S. reniforme* Raf.), which Small cites from "Blue Ridge, N. C. and Appalachian shale slopes, Va." Dr. Perry, in her study of the group, saw only one specimen from the state, that from Bath County[1] at the extreme western border. The plant is relatively abundant at our station at the inner margin of the Coastal Plain, 125 miles to the east of the old Virginian station. In a springy and boggy clearing, where everything was oversized, *Digitaria Ischaemum* looked quite unfamiliar. I can make it nothing but var. *mississippiensis*, which Hitchcock cites only from "Maryland, Tennessee and South Carolina."

Returning toward Petersburg to spend the night, we selected as an attractive temporary home "Century House," on the land of which our spring-fed pond of the afternoon was located. The owner, Mrs. Bowman, instead of reprimanding us for trespass, urged us to continue our exploration of the pond next morning. So convenient were the quarters she gave us, so kind and ready to help were Mrs. Bowman, her son, Robert, and the general man about the place, William, and the most agile of colored boys, Isaac, that we at once conceived "Century House" as the ideal center for the next season's work.

Near the head of Nottoway Swamp, about midway between Sedley and Courtland, the topographic sheet shows a large pond with three antler-like narrow bays. It is there entered as Darden Millpond but, so far as we could learn, that name is forgotten and the present name is Predler's Pond. Our unvarying experience had been, that millponds have no broad natural beaches and botanically are quite uninteresting, being recent man-made habitats with no native specialities. Consequently, when we came to the broken-down dam at the outlet and saw above it miles of broad beach carpeted with vegetation, we knew that unexpected things awaited us. The regular plants of damp peat, sand and clay formed a turf 50 to 100 feet broad, with tiny and diffuse rills seeping down to the pond. Such species, local in Virginia, as *Eragrostis hypnoides*, *Axonopus furcatus* and *Panicum agrostoides* abounded, but we were more interested in the extensive patches of *Paspalum dissectum* and the superabundant *Oldenlandia Boscii*, the latter occurring as prostrate, freely branching plants up to 4 or 5 dm. across! *Oldenlandia Boscii* had been new to Virginia when, a year

[1] Perry in Rhodora, xxxix. 295 (1937).

before, we found tiny plants on the alluvium at Courtland; and the previous Virginian voucher for *Paspalum dissectum* had been a solitary starved individual from the silt of the Nottoway at Cypress Bridge. Best of all, *Digitaria serotina*, the first from the state, was here. The species was included by Hitchcock in the 7th edition of Gray's Manual from "s. Pa., Del., and southw."; but in his later Manual of the Grasses (1935) Hitchcock modified his statement of range to "Coastal Plain, North Carolina to Florida and Louisiana; Philadelphia (ballast); Cuba." By Predler's Pond it was an ingredient in the natural turf. The shore-line of Predler's Pond is two and a half miles long. In two hours we inspected one-tenth of that distance. *Paspalum dissectum* was seen only once, as we started from the outlet; *Digitaria serotina*, likewise, was noted only a single time, at the point where we felt that we must turn back. Much smaller Winter Pond in Middlesex County, Massachusetts, still yields previously undetected rare species after a century of botanizing. One brief visit to one-tenth of the beach of Predler's Pond has not exhausted its possibilities; but, unfortunately, we may never see it in the condition of 1937. In June, 1938, the dam had been reconstructed and absolutely no beach was in sight!

Driving toward Courtland for a long-delayed lunch, we came into unspoiled (except for some chopping) wet pineland. *Carphephorus tomentosus* was here and, although we were all nearly starved and it was mid-afternoon, we had to stop for the beautiful simple-leaved *Coreopsis* which grew at the border of the wet woods and in the ditches. Clearly the same as the plant of southwestern Nansemond which I had earlier identified and reported as *C. gladiata*, it was here more abundant than at our first station. In the past, the name *C. gladiata* has been variously used. Now that Sherff has monographed the genus, it becomes perfectly clear that the Virginian plant is not that species. Its achenes are unique and I am forced to recognize it as a very definite new northern member (Plate 533 and 534, figs. 1, 5 and 8) of a prevailingly more southern series. With this undescribed *Coreopsis* and a *Panicum* which is puzzling, there was a wonderful *Solidago*, which we had already found in low woods not far from the University of Richmond, a plant with large heads borne in slender one-sided wands which reach a length of 4 dm. or more, another species (Plate 532, figs. 1–4) which seems never to have been described.

After the experience with Predler's Pond we tried many other

ponds, usually with no luck; but, detecting on the contour-sheet a pair of tiny blue landlocked spots called Cat Ponds, not far from Benns Church in Isle of Wight County, we proceeded there. Most such little blue spots on the map had led us to small inundated bits of gum-swamp or other uninteresting depressions. One of the Cat Ponds was of this type, but the other (the larger) was a joy—a shallow pond with open beach a few rods wide, a good replica of the famous Cape Cod ponds. The pond itself was full of Maidencane, *Panicum hemitomon*, which in 1936 had been "new to Virginia." With it was very luxuriant *Sagittaria graminea*, the first we had ever met in eastern Virginia. The turfy beach had many of the regular pond-shore plants but there were enough others to keep us closely inspecting everything and watching for novelties until long after lunch-time. *Hypericum denticulatum* var. *ovalifolium* was here abundant and safe from destruction, its previously known small station northwest of Homeville being in constant danger from fire and clearing. *Ludwigia sphaerocarpa*, var. *jungens*, which had been known in Virginia only at the type station, Cape Henry, where Griscom and I got it in 1933, was abundant; and two of the sedges specially pleased us: *Eleocharis melanocarpa* and *E. tricostata*, neither of which had been seen by Svenson, in his recension of the genus,[1] based on all accessible herbaria, from between southern Georgia and New Jersey. Cat Pond, like Predler's Pond, may repay other visits, at different seasons and in different years, and its owner, Mr. Hatfield, seems glad to have it weeded.

Planning to have a glimpse of Williamsburg and to dine there in the evening, we crossed the big James River bridge to the Peninsula of Virginia. This being the area which Grimes and his wife had so much explored and our time before dark being very limited, we could expect little of novelty. Suddenly, however, we were impressed by a tall plant with slender spikes in broad corymbs—*Verbena brasiliensis*, unrecorded from north of Wilmington, North Carolina. A bit of dry open woods gave us *Antennaria solitaria*, which the Grimes's reported only with doubt, and *Galium uniflorum*, new to the Peninsula; and one of the tiny pond-holes yielded *Erianthus strictus*, which a few days earlier had been "new to Virginia," and *Panicum spretum* and *Proserpinaca pectinata*, neither of them found by Grimes. In the twilight,

[1] See Svenson, Rhodora, xxxiv. 219 (1932) for the latter; ibid. xxxix. 270 (1937) for the former.

near Yorktown, we added three more plants to the flora of the Peninsula: *Setaria magna*, *Lippia lanceolata* and *Diodia teres*, var. *hystricina*. If we had only started at the beginning, instead of the end of the day, the known flora of the Peninsula of Virginia would have been vastly increased.

The last day of the season in the field was only a brief one. Just outside Homeville the superb *Crotalaria spectabilis* Roth[1] was beginning to flower; and near our station for *Houstonia tenuifolia* and other species isolated in oak and hickory woods a very strange grass attracted us. Obviously somewhat transitional between *Paspalum* and *Panicum*, it belongs with the wholly anomalous *Paspalum bifidum* (Bertol.) Nash, heretofore unknown north of South Carolina. The Virginia plant differs, however, in several characters from the more southern extreme and constitutes a good isolated variety (Plate 509).

Early spring in southern Virginia was phenomenally advanced in 1938. We had watched for some weeks the daily records from Norfolk of summer temperatures. Consequently, when we reached Century House, south of Petersburg, we were not surprised to find that, early in April (2–10) spring was already fully on. Woodlands were splendid with *Wisteria*, *Cercis*, *Pyrus* (§ *Malus*), *Crataegus*, *Cornus florida* and *Rhododendron* (§ *Azalea*) in full bloom. The earliest-flowering herbs (*Alopecurus carolinianus*, *Luzula bulbosa*, *Holosteum umbellatum*, *Cerastium viscosum*, *Cardamine hirsuta*, *Arabis virginica*, *Veronica persica*, etc.) were already scattering their seeds. Since Carroll Williams was unable to join us and Robert Bowman was regularly employed, we had asked Mrs. Bowman to secure a driver and helper for us. She had most wisely selected Meade Lewis, a young man all his life familiar with the woods, with the eye of a trained hunter and skill in driving such as one rarely meets. We soon had him closely watching the woods and thickets and he took keen delight when he was first to see something new to us, remarking: "It isn't fair! You two have nothing to do but watch the woods, but I have to keep on the road, avoid drunken drivers and do the botanizing." When we found tiny plants, like *Myosurus minimus* and *Plantago heterophylla*, growing in a field with *Poa Chapmaniana*, *Sagina decumbens*, and other dwarf species, all we had to do was to give a sample to Meade and ourselves start the hunt for something else, knowing that he would collect the needed series. *Buxbaumia aphylla*,

[1] See Larisey in this no., 361, pl. 508.

the essentially leafless moss with fruits only 2 or 3 mm. long, was his great joy; and, as we were hunting for it in the pinelands south of Zuni, we could hear his shout, "Here's more of that bed-bug moss. Gee! these are giants!"

The hot early spring with little rain, following a dry and essentially frostless winter, had made the bottomlands and big swamps quite accessible, whereas in 1937 they had been flooded; but the day before we arrived heavy rains had come and these continued interruptedly during the trip. Frosts were now frequent and three mornings ice formed on small pools. The vegetation, although slowed down, was, fortunately, not much injured; we could tramp in complete comfort, except for the rain; and a furnace-fire was maintained at the house, so that our ventilated presses were stacked upon the radiators, giving ideal drying conditions. Many species not represented in northern herbaria by good flowering material were collected and we soon became active at our old game of finding species new to Virginia.

Just as in April of the year before, neglected cotton-fields were carpeted with a dense growth of quickly maturing winter-annuals, now in anthesis or in fruit. In such transient habitats the dwarf *Ranunculus parviflorus* was fruiting, *Myosurus minimus* and *Plantago heterophylla* closely simulated one another, *Poa Chapmaniana* was expanding its slender panicles, *Arabis virginica* was fruiting (impressing us as neither an *Arabis* nor a *Cardamine*), and *Spergula arvensis* var. *sativa* (new to Virginia) was frequent. In one old field, where, a year earlier, some of these species abounded, they were now wanting and their place was taken by *Holosteum umbellatum* which we did not see the year before. The quick-growing weeds, however, were not confined to old cotton-fields. Stopping on the "soft-shoulder" of a road to investigate a leaking tire, we found ourselves in an abundance of *Teesdalia nudicaulis* (L.) R. Br., a European species, evidently included with the seed of European *Lolium perenne*, which was extensively planted along the new roadsides. Again, stopping in Wakefield to make an inquiry, we noticed that the annual *Cerastium* of the worn-out grassland was not the ubiquitous *C. viscosum*. In this case it was the European *C. tetrandrum* Curtis, heretofore not recorded as American.

The hoary-pubescent *Plantago virginica* was scarcely in flower; but, associated with it or exclusively occupying areas of dry sand or clay, there was a small and green *Plantago* in full flower or even in fruit.

This puzzled us, for we knew of no relative of *P. virginica* which it could be. In Part II I shall further discuss it (Plate 530, figs. 4–6).

We stopped for a brief check of the sandy pine barrens of Isle of Wight County, not expecting additions, but for the joy of seeing *Pyxidanthera* in full flower and because the area is one of fascination and real individuality. *Carex pensylvanica* and *C. tonsa* abounded and, slightly southward (near Walters), there were carpets of *C. umbellata*. These would hardly stir the enthusiasm of a botanist of New England, Pennsylvania and New Jersey; but, singularly enough, all three make their debuts as members of the Virginian flora, Mackenzie (in N. Am. Flora) having seen none of them from the state!

The bottomlands, as already noted, were dry and quite accessible, carpeted with great flowering colonies of *Podophyllum*, fruiting ones of *Sanguinaria* and innumerable violets. On many of the richer bottoms *Senecio aureus* was in full bloom, amazing to a northerner, who has known the northern plant of swamps and peaty thickets, through its gigantic size and the *thick, elongating, purple basal offshoots*. The plant of these bottoms is true *S. aureus* of Linnaeus; perhaps the northern and transcontinental plant is wrongly identified with it. On the bottoms generally *Ranunculus abortivus*, pale-green and with characteristically cleft cauline leaves, abounds; but along the Nottoway and its tributary, Three Creek, it is chiefly represented by a plant with lustrous dark-green and quite undivided cauline leaves, a striking and apparently quite localized variety (Plate 518) which will be further considered in Part II.

The patch of rich, deciduous woods slightly east of Emporia, near Metcalf Branch, had, in previous seasons, yielded good results. On the bottomland itself we had previously collected *Hydrangea arborescens* and fruiting specimens of a small tree which we took to be *Aesculus discolor* Pursh, then new to Virginia. In early April, 1938, the latter was freely flowering, both in the bottomland woods and higher up; its identity is now established. *Clematis ochroleuca* was flowering in the dry woods; *Coreopsis auriculata* was recognizable, though young; and, on the bottomland we got our only collection on the Coastal Plain of *Phacelia*, in this case the beautiful *P. dubia*, a plant chiefly of the interior. In May, 1935, Griscom and I had been much impressed by the exceedingly long peduncles of the staminate spikes which characterized *Carex digitalis* on Little Neck in Princess Anne County. In the rich woods east of Emporia the same plant

abounds and it has subsequently proved to be typical of such habitats on the Coastal Plain of Virginia, thence southward. It so far departs from true *C. digitalis* as to merit recognition as a southern variety (PLATE 511, FIGS. 3 and 4).

Slightly north of Emporia, in the rich woods along Three Creek, where *Saxifraga virginiensis*, *Hystrix patula* and some other inland species reach the margin of the Coastal Plain, there is a rich development of *Viola*. Among the complex series we got the southern *V. esculenta* Ell., heretofore known in the state only from a single station in Norfolk County. Farther down Three Creek, near Drewryville, the violet-population contained the characteristic *V. Langloisii* Greene var. *pedatiloba* Brainerd, previously known only from Louisiana; and about spring-heads in rich woods slightly east of Drewryville the essentially northern, rather than southern, *Lycopodium lucidulum* hides under abundant clumps of *Dryopteris celsa* (Wm. Palmer) Small of the Great Dismal Swamp.

Rich loamy woods were evidently the habitat where the best botanizing was to be found in early spring; consequently, with the hope of finding on the Coastal Plain other stations for plants of the interior, we started for the rich slopes and gullies along the James near Claremont. On the way we were attracted by the lush vegetation on the bottomland of Powell's Creek, near Garysville. The inland *Sedum ternatum* here made extensive mats; and on the dry wooded slopes were other plants of the interior: *Stellaria pubera*, *Anemonella*, *Hepatica americana*, *Chrysogonum virginianum* and several others. Our best area, on this trip, however, was near Claremont. Here the fossiliferous sands and clays are near the surface and the banks of streams and the wooded gullies conspicuously display them. Calcareous springs and rills abound and the freely available "marl" and the friable soil support rich forests of *Ulmus fulva*, *Asimina triloba*, *Juglans cinerea*, *Fraxinus americana*, *Tilia heterophylla* and *Michauxii* and many other trees and shrubs hardly characteristic of the Coastal Plain. On the wooded slopes *Hydrangea arborescens* abounds and *Menispermum canadense* twines with *Vitis vulpina*. The herbaceous flora is as rich as one could ask, with *Orchis spectabilis*, *Aplectrum hyemale*, *Cimicifuga racemosa*, *Dentaria laciniata*, *Heuchera americana*, *Thaspium barbinode*, *Obolaria*, *Nemophila microcalyx* and *Antennaria solitaria;* and in one gully *Hybanthus concolor* forms almost a thicket, nearly a meter high!

The calcareous rills in the woods near the head of Sunken Meadow, slightly south of Claremont, are bordered by a tall and broad-leaved *Scirpus* which was quite strange to us. In early April it was coming into bloom; in mid-June, when we again collected it, it was shedding its achenes. Suggesting the Coastal Plain *S. divaricatus*, it is coarser, with axillary as well as terminal umbels and with distinctive spikelets, scales and fruits. It proves to be the very rare and little known *S. fontinalis*, described by Harper from calcareous wooded spring-heads in Georgia. Here, in a single but extensive calcareous area tributary to the James, it abounds with Alleghenian species which intrude into the Coastal Plain from the west. So far as known it has not been detected between Georgia and Virginia!

It was two months before Long and I could return to Virginia. Rain had poured down on the already drenched land and continued to do so during much of our field-work (June 8–19). Vegetation was luxuriant and all but the bottomland species were prospering. The latter were hopelessly submerged, though we did succeed in extracting from the flooded bottomlands of the Nottoway and the Meherrin fine flowering series of Acanthaceous herbs (*Justicia* and *Ruellia*); and on the bottomland of the Meherrin about Haley's Bridge there was another member of the family which is surely not in Gray's Manual. Its identity must await the collection of flowering or fruiting material. This special bottomland was the only one on which we could get much accomplished. In 1936 we had got, along with the endemic *Carex crus-corvi* var. *virginiana* Fernald (in Rhodora, xxxix. 393, pl. 476, figs. 1–5), a representative of *C. vulpinoidea* with blue-green (instead of yellow-green or golden) tones. It was important to get more; so, after a visit to Hart's Bridge in southern Southampton County, we swung over to Haley's Bridge. The water, in the late afternoon of June 16th, was low enough on the flood-plain for us to travel easily, although shrubs and herbs all bore a heavy crust of alluvial mud and silt. While collecting further material of the two *Carices* we were diverted by a strange flexuous and membranous-leaved *Scirpus*, trailing or reclining at the margins of the bottomland creeks. Its inflorescence suggested that of the common erect and densely cespitose *S. atrovirens* var. *georgianus* (Harper) Fernald, but the rhizome was elongated and it bore only a solitary culm from the crown formed the preceding year. So consistent was the plant in its elongating rhizomes, solitary weak and trailing culms and flaccid, smooth leaves that we

collected it until ominous thunder indicated the necessity to start for Emporia and supper.

Returning on the 18th for better material of the strange new *Scirpus* and to retrieve the specimens of *Carex crus-corvi* var. *virginiana* which, in our haste of two days before to get under cover, had been left behind, we started lower down, nearer the Bridge. *Carex caroliniana* Schwein., the first we had seen in Virginia, was overripe but recognizable, the culms reaching the phenomenal height of 1.65 meters. *Euphorbia obtusata*, in past years always scarce, was here abundant. The ditch along the road through the wooded bottomland had, to us, a strange appearance, from the ripe heads of *Scrinia oppositifolia*, the first station known north of South Carolina. In the woods *Arisaema Dracontium*, the last plant one would look for on the Coastal Plain, was vigorously developed; and green rosettes were certainly those of *Spiranthes ovalis*, not yet in flower. In 1936[1] I showed that one of the commonest grapes of southeastern Vigrinia is *V. cinerea*, var. *floridana* Munson (*V. Simpsoni* Munson), although it had been supposed not to extend north of southern Georgia. Here, at Haley's Bridge, however, it is represented by the silvery-tomentulose typical *V. cinerea*, in the East not supposed to occur north of Florida. Reaching the *Scirpus* station we were chagrined to find it under four to six feet of water. That part of the bottomland was again not to be explored this trip (nor, as it proved, during the July trip).

Starting back to Emporia, with a feeling of partial defeat, we stopped at an extensive peaty clearing, to collect "anything else" before supper-time. And the anything else this time proved to be a slender branching *Polygala* with the habit of *P. verticillata* var. *ambigua*, but with the relatively showy milk-white racemes composed of much larger flowers, with wings 2–2.6 mm. long and much overtopping the capsules. Perfectly typical *P. verticillata* (*P. Pretzii* Pennell) grew near-by, as well as characteristic *P. verticillata*, var. *ambigua*, with every transition one could ask for, but the plant with larger white flowers was a stranger (PLATE 525, FIGS. 1 and 2). It proves to be an extreme of the species represented in the Gray Herbarium only from Missouri, Arkansas and Oklahoma—a geographic relationship now very familiar to us in eastern Virginia.

We had gone to Haley's Bridge via Hart's Bridge (south of Sunbeam) and Statesville, because in April we had seen in rich woods

[1] RHODORA, XXXVIII. 426 (1936).

between Hart's Bridge and the North Carolina line young leaves of what we took to be *Sanicula Smallii*. The flowering and fruiting plants were very typical—a very definite species with subcoriaceous leaves and tuberous-thickened roots. At the border of sandy woods at Hart's Bridge I was attracted by a strange grass. It proves to be *Panicum chrysopsidifolium* Nash, which Hitchcock (Man.) indicates only from Texas, Arkansas, Louisiana and Florida; and near-by, stimulated by the perpetual irrigation and manuring of the weeks of freshet, *Crotalaria Purshii* was growing to a height of 4.5 dm.

But to begin at the beginning. Our first day's field-work in June had progressed only a few minutes, when, south of Petersburg, we were amazed to find *Juncus brachycarpus* abundant in almost any argillaceous swale. This very definite species, simulating the mid-summer and autumn *J. scirpoides* but with short and broad capsules and soft, instead of acerose, perianth-segments, has been considered one of the rarest of rushes on the Atlantic slope; but in June, in south-eastern Virginia, it was seen everywhere we went and in July we found it (over-ripe) northward to the Gloucester Peninsula. It becomes highly probable that its reputation for rarity is due to its early maturing and later being mistaken for old and passé inflorescences of the common *J. scirpoides*. Barely three miles south of Petersburg, along the tracks of the Atlantic Coast Line, there are some wet argillaceous depressions which proved fascinating. The best find here was an almost black-headed *Eleocharis*, strange to us. In rhizome and habit it is *E. capitata* (*tenuis*) but the very dark and coarsely pebbled achenes with strongly depressed tubercles are a close match for those of *E. capitata* var. *verrucosa* Svenson, which its author had seen only from the Mississippi Basin.

Space does not permit recording all the thrilling (and disappointing) days. Visits to localities already known to be good yielded additional rarities: the swale north of Littleton, which is still our only station for *Polygala ramosa*, supplying *Acerates floridana*, apparently the first in the state, and a really definite new blackberry (*Rubus*) of the *cuneifolius* series, but with depressed habit, acuminate leaflets and many other distinctive characters (Plates 521 and 522); the area north of Emporia, where, in 1936, Griscom, Long and I found *Schwalbea americana*, yielding our first station for the long-sought *Drosera brevifolia;* a similar but drier area of pine and oak woods at the boundary between Greensville and Sussex Counties supporting

Schwalbea in great abundance and a good colony of *Eryngium yuccifolium;* the margin of Somerton Creek with the tropical *Pontederia lanceolata* Nutt. forma *brasiliensis* (Solms) Fern.,[1] the first from north of Florida; and the springy thicket north of Factory Hill (type-locality of the slender *Corcopsis* noted above) with the first colony of *Erigeron vernus* known to us in Virginia except back of the dunes of Princess Anne County.

Other localities deserve fuller notes; I will restrict myself to four limited ones and a fifth of more generalized character. The white-sandy open pine and oak woods and barrens between Franklin and Smith's Ferry yielded in September, 1937, a remarkable group of novelties. In June such habitats are not likely to display much of distinctive character. However, stopping to look over the type station of the new *Chrysopsis* related to *C. gossypina,* we were impressed by the presence there of low thickets of *Comptonia,* the Sweet Fern, the first we had ever met on the Coastal Plain of Virginia. Always familiar with what in New England and eastern Canada we call *Comptonia* (or *Myrica*) *asplenifolia,* I was greatly impressed with the small and glabrous foliage, the non-pilose branchlets and the tiny fruiting aments of the shrub south of Franklin. Comparison in the herbarium shows that there are two strongly defined varieties in the species: one of wide range across southern Quebec and Ontario, thence south across the Maritime Provinces and the northern states and locally southward in the interior of the continent, a shrub with pilose or villous new branchlets, more or less pubescent foliage, large fruiting aments and other characters to be discussed in Part II (PLATE 514, FIGS. 7–10); the other a pine-barren shrub, the small extreme (PLATE 514, FIGS. 1–6) in southeastern Virginia, also in the pine barrens of New Jersey and Long Island. Linnaeus proposed two species for these shrubs: *Liquidambar peregrina,* "*Habitat* in Canada," obviously the common northern shrub; and *Myrica asplenifolia* "*in* America *septentrionali,*" with numerous literary references. One was to Gronovius. In so far as the Clayton plants (Gronovius) were involved they were presumably both the varieties. Most happily, Clayton, recognizing the rarity in his region of the shrubs, specially noted the localities: "In Comitatu Lancastriae crescit, & ad ripam saxosum praeruptum fluminis Northanna in opacis sub abietum tegmine initio Junii absque indiciis fructificationis reperi." Presumably

[1] See RHODORA, XXVII. 81 (1925).

Clayton's material from Lancaster County is like the Southampton County shrub; with equal probability his shrub from steep shaded slopes by North Anna River (well back in the Piedmont) is the wide-ranging one.

With the *Comptonia* and the *Chrysopsis*, *Stillingia sylvatica* was superabundant, its crowns producing several ascending branches with lustrous leaves and, in mid-June, tipped by the slenderly conical yellow-green inflorescences. Farther south, at our original Virginia station for *Tradescantia rosea* var. *graminea*, *Cirsium repandum*, the first known from Virginia, was blooming; and near a fine thicket of *Phascolus polystachyus* there was a strange *Physalis*, with young flowering buds. Most of the area where the latter originally occurred is cleared and under unsuccessful cultivation (chief crop uninvited *Opuntia*), so that the *Physalis* is now very rare. Two fruiting plants collected in July show it to be *P. monticola* C. Mohr, heretofore supposed to occur only in the mountains of Alabama.

The small patch of rich deciduous woods by Metcalf Branch, east of Emporia, always yields something interesting; and in June we were humiliated to find that one of the most abundant trees there is *Acer floridanum* Pax. We had previously been so absorbed in the herbaceous vegetation that we had not noted the maple. Small, under *Saccharodendron floridanum*, gives the range: "Fla. to La. and S. C. Naturalized in N. C. Reported from Va." The report is that of Sargent (Man.) from Dinwiddie County. Surely *Acer floridanum* is indigenous east of Emporia and in its shade, besides local species already enumerated (p. 374), are *Silene virginica* (the only time we have seen it on the Coastal Plain in the state), *Carex flaccosperma* (plants either yellowish- or blue-green) and *Rosa carolina* var. *glandulosa* (Crépin) Farwell, which is certainly not common. Descending to the bottomland (the day we were there well dried out) of Metcalf Branch we were much impressed by the tall blue-green clumps of a *Glyceria*, with broad and flaccid horizontally divergent ribbon-leaves with long ligules and elongate panicles of reflexed branches, suggesting the panicle of *Milium effusum*. We were so impressed with this strange grass that we collected and carefully laid out nearly 20 sheets. It is fortunate that we did so, for it is very typical *G. arkansana* Fernald, described from Arkansas and Louisiana. Slightly to the east, on the slope of spring-fed woods, where *Carex Collinsii* (second station in the state) abounds, there are splendid trees of *Fraxinus biltmoreana*,

assigned by Small (Man.) to "Blue Ridge to Appalachian Plateau." The *Fraxinus* also occurs on the Coastal Plain in Dinwiddie County, at one of the first Coastal Plain stations for *Phlox carolina*, var. *triflora* (Michx.) Wherry.

Not far from Stony Creek in Sussex County there are rich woods, with a Piedmont flora. On this trip we got there *Woodsia obtusa* (the first station known to us on the Coastal Plain) and *Scrophularia lanccolata* Pursh, a trans-continental and northern type, which Pennell (Scroph. E. Temp. N. Am.) had seen only from the Blue Ridge and the Alleghenies in Virginia. The road from Stony Creek to Sussex Courthouse goes through much unspoiled and botanically productive country. The most distinctive feature, perhaps, is the great development of almost savannah-like swales in the open woods bordering the swamps of the Nottoway. One such swaley area was given over, in June, to a few species, making a solid swale of many acres: *Carex Barrattii* (not seen by Mackenzie from Virginia), *C. bullata* (do.), *C. Buxbaumii* (do.), *Panicum scabriusculum* and *P. consanguineum* and *Juncus Elliottii*. No plant with showy flowers was seen there in June. We are looking forward to possible novelties in August and September.

We invited Professors A. B. Massey of Blacksburg and Robert Smart of Richmond to join us for a week-end. Unfortunately Smart was under the weather (being too accustomed to it) at the time and Massey was crowded with routine work. We had his companionship for a too brief morning and, time being limited, we decided on trying the Waverly region, as the most accessible area of sandy pinelands. Long and I hardly expected novelties from an area much investigated, but, fortunately, we left the car at a new spot. The woods had, besides the familiar pineland types, a most definite *Sisyrinchium*, erect, with filiform leaves and a pair of spathes, *S. capillare* Bicknell, a Coastal Plain species not recorded from so far north; and the wet depression, now filled with water, was largely given over to *Rhynchospora perplexa* Britton, another species unrecorded from north of North Carolina.

Unfortunately Massey had to leave before lunch, in order to make Blacksburg before dark (foreseeing inevitable rain); so that we were obliged to continue the day without him. Being only a few miles south of Claremont and wishing to get mature material of the strange *Scirpus* (*S. fontinalis*) found in April we proceeded there; and on this

and two suceeding days we had all we could handle in the neighborhood of Claremont, where the highly fossiliferous sands and clays support as rich and luxuriant a vegetation as any on the Coastal Plain. The flora is, however, definitely not a typically Coastal Plain one; it is of the Blue Ridge and the Appalachian Upland, as we had already noted in April (p. 375). We collected in three areas in June: in the woods along upper waters of Sunken Meadow Creek (south of Claremont), in the gullies and back of the beach of the James at Claremont Wharf, and, a few miles down river, in similar habitats below Sunken Meadow Beach. All three areas were similar in physiognomy and very near together; yet each had its own specialties (and in July all other spots examined in the fossiliferous Miocene beds were similarly found to have marked individuality). All three areas had *Bromus purgans*, typical *Ostrya virginiana* (with glabrous twigs), *Laportea canadensis* (making botanizing most uncomfortable), *Menispermum canadense*, *Cryptotaenia canadensis* and *Sanicula gregaria*. Only in the woods at the head of Sunken Meadow Creek did we see *Scirpus fontinalis*, *Symplocarpus foetidus*, *Thalictrum revolutum*, *Euonymus atropurpureus*, *Thaspium barbinode*, *Collinsonia canadensis*, *Viburnum acerifolium*, *Eupatorium purpureum* (*E. trifoliatum*), *Silphium atropurpureum*, *Coreopsis auriculata* and *Heliopsis helianthoides*. A few miles to the north, at Claremont Wharf (on the James) we found our only station in the region for *Adiantum pedatum* (stipes up to 6.5 dm. high), though it is probably general in the region, *Athyrium thelypteroides* (fronds up to 1.25 m. high), *Brachyelytrum erectum*, *Elymus villosus*, typical (only forma *arkansanus* at the head of Sunken Meadow Creek), *Carex bromoides*, *Frankii* and *Grayii*, *Smilax pulverulenta*, *Quercus borealis* var. *maxima*, *Caltha palustris*, *Tilia heterophylla*, *Hybanthus concolor* (very abundant in the gully with *Dryopteris celsa*, *Athyrium thelypteroides*, *Scutellaria versicolor*, etc.), *Aralia racemosa* and *Teucrium canadense* var. *virginianum*. Down river a few miles, in similar habitats below Sunken Meadow Beach, other notable (for the Coastal Plain) species were localized: *Deschampsia flexuosa*, *Smilax hispida*, *Quercus montana*, *Arabis laevigata* (in great profusion and luxuriance), *Sedum ternatum*, *Physocarpus opulifolius*, *Staphylea trifolia*, *Hypericum prolificum* (in July found in great abundance in woods of Flowerdew Hundred, the shrubs there up to 2.5 m. high), *Fraxinus americana*, *Agastache nepetoides*, *Stachys Nuttallii*, *Conopholis americana*, and *Houstonia longi-*

folia. At both Claremont Wharf and Sunken Meadow Beach some specialties were found: *Dryopteris celsa* (rare at the latter, superabundant and up to 1.2 m. high in a gully and adjacent cypress swamp at the former locality), *Populus deltoides*, *Cimicifuga racemosa*, *Astragalus canadensis*, *Osmorhiza longistylis* var. *villicaulis* and *Scutellaria versicolor*. In July many of these species were seen still farther down the James, at Eastover. Surely this portion of the Coastal Plain is a tongue of the Appalachian Upland pushing far to the southeast. But at Sunken Meadow Beach one plant was found which, thus far, is known only from a single spot. It is a *Coreopsis*, related to the commonly cultivated *C. grandiflora* and *C. lanceolata* but differing in many striking characters. So far as I can make out it is an undescribed species (PLATE 535, FIGS. 1–9).

In the gullies and brook-valleys north and northwest of Surry the fossils are sometimes near the surface; consequently there is another localized series of species. The best of the areas we found was a gully, heavily wooded with beech, with the undergrowth principally *Dirca palustris*. This is the only place we had ever met *Dirca* in eastern Virginia; and neither of us had ever imagined such domination of a forest-floor by it, tree-like shrubs up to 3 m. high, with the larger trunks 7 cm. in diameter. Adding to the relatively boreal aspect was a fine colony of the very characteristic *Antennaria munda* Fernald in RHODORA, XXXVIII. 229, plate 433 (1936). This species is characteristic from central Maine and southern Quebec to the region north of Lake Superior, south to Massachusetts, Connecticut, northeastern Pennsylvania, etc. Looking from it through the trunks of *Dirca* and *Fagus*, and noting our only colony of *Dennstaedtia punctilobula* at the border of the woods, one might think himself in western New England; but the thousands of plants of *Ponthieva racemosa* at the bases of the slopes would quickly bring him back to the South.

I have summarized some of the "high lights" of our Virginian work up to the summer trips of 1938. The discussion of problems arising from the latter most necessarily be postponed. They are still yielding abundant results, and on the July trip we were gratified to rediscover at least two species (*Burmannia biflora* and *Aeschynomene virginica*) unknown in the state since their discovery by Clayton. There is plenty to do; there are too few equipped to do it.

Part II. Enumeration of Significant Species

In the following enumeration the plan of former papers is followed, of listing stations for rare or local plants and of discussing novelties which have come to attention during the working-up of the Virginia collections. Some collections of previous years are included; while many species of the recent collections are not here noted, their exact identification awaiting further study. In general, no new species collected during the summer of 1938 are included, although records from the miscellaneous material from these trips are given whenever their inclusion has caused no appreciable delay in finishing the present paper.[1] Plants apparently new to the flora of Virginia are indicated by an asterisk (*). The field work in September, 1937 and in April and June, 1938 was made possible through a special grant from the Milton Fund for Research of Harvard University; that carried on in the summer and autumn of 1938 through an anonymous gift from a generous friend to aid phytogeographic research. The plates are largely the work of Dr. E. C. Ogden or of Henry G. Fernald, the cost of the photography and the making of the blocks largely defrayed from a grant for research from the Division of Biology of Harvard University. The cost of printing the plates has most generously been met by my loyal companion on all the recent work in Virginia, Mr. Bayard Long.

Woodsia obtusa (Spreng.) Torr. Sussex County: rich wooded slope, 4 miles south of Stony Creek, *F. & L.*,[2] no. 8000. Prince George County: rich woods, Coggins Point, no. 8910. See p. 381.

Apparently the first records from the Coastal Plain of Virginia.

Dryopteris celsa (Wm. Palmer) Small. To the few stations recorded add Southampton County: about spring-heads in rich deciduous woods east of Drewryville, abundant, no. 8005. Surry County: rich calcareous wooded gullies and adjacent cypress swamp, by James River, Claremont Wharf, thousands of plants with fronds up to 1.2 m. long, no. 8006; rich wooded gullies along James River, below Sunken Meadow Beach, no. 8007. See pp. 375, 382, 383.

[1] Additional stations for many of the rare plants recorded in this paper (*Dryopteris celsa*, *Paspalum dissectum*, *Erianthus strictus* and *brevibarbis*, *Rhynchospora perplexa*, *Ponthieva racemosa*, *Pyrus serotina*, *Dirca palustris*, *Oldenlandia Boscii*, etc.) but discovered too late for inclusion must await the publication of another article.

[2] The same abbreviations of collector's names are used as heretofore: *F. & G.* (*Fernald & Griscom*); *F. G. & L.* (*Fernald, Griscom & Long*); *F. L. & F.* (*Fernald, Long & Fogg*); *F. L. & S.* (*Fernald, Long & Smart*). The abbreviation *F. & L.* (*Fernald & Long*) for the collectors of most of the cited numbers will be omitted, as quite unnecessary.

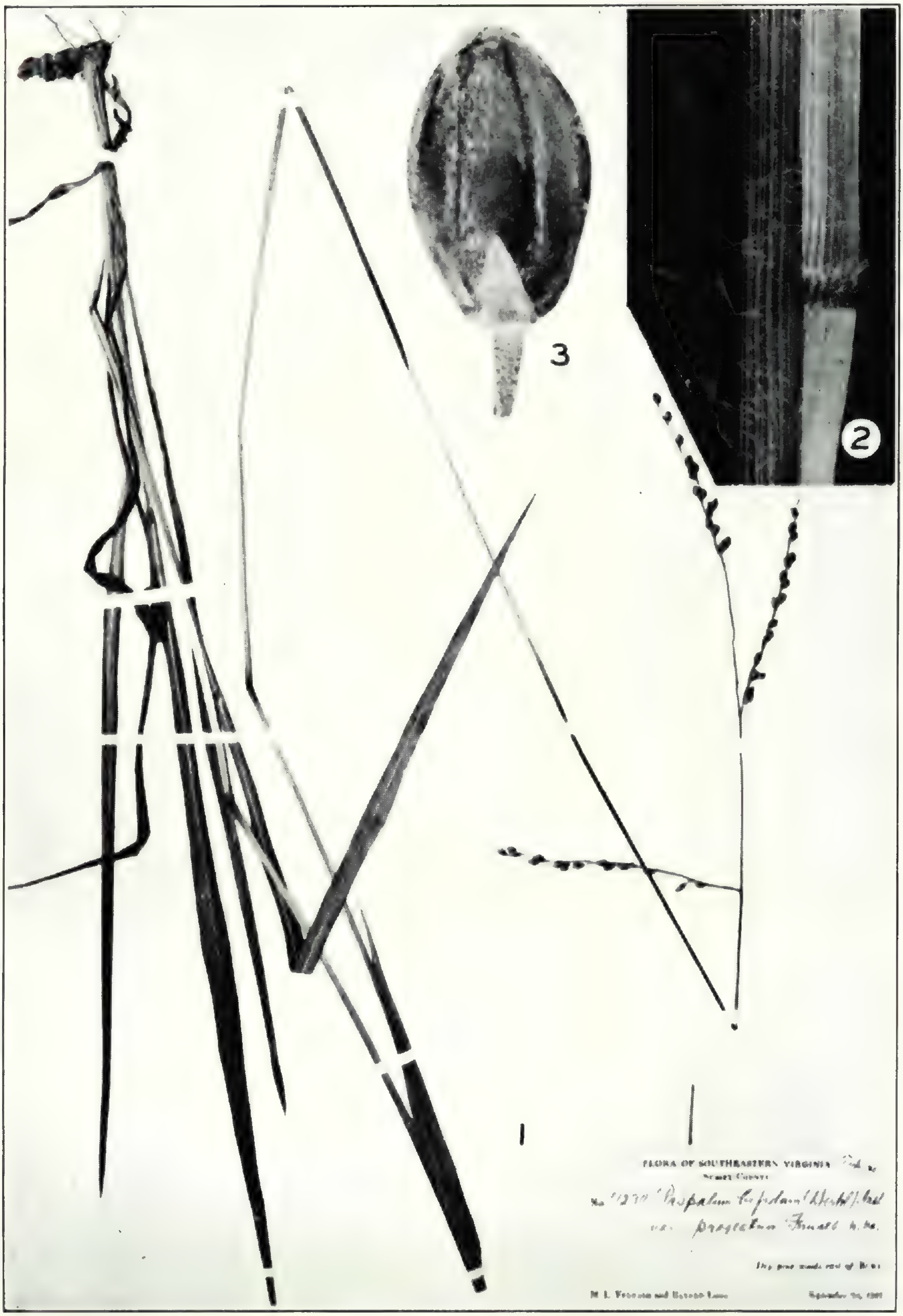


Photo. E. C. Ogden.

PASPALUM BIFIDUM, VAR. PROJECTUM: FIG. 1, plant, × $^{2}/_{5}$, of TYPE-COLLECTION; FIG. 2, sheath, × 4; FIG. 3, spikelet, showing 1st glume, × 10.

Photo. E. C. Ogden.

BULBOSTYLIS CAPILLARIS: FIG. 1, TYPE of *Scirpus capillaris* L., × 1 (courtesy of Mr. SPENCER SAVAGE); FIG. 2, base of type of *Stenophyllus capillaris*, var. *pycnostachys*, × 2; FIG. 3, inflorescences of the latter, × 1.

Var. CREBRA: FIG. 4, portion of type, × 1; FIG. 5, base of TYPE, × 2.

Var. ISOPODA: FIG. 6, inflorescences of TYPE, × 1.

ATHYRIUM THELYPTEROIDES (Michx.) Desv. SURRY COUNTY: rich calcareous wooded gullies by James River, Claremont Wharf, thousands of plants forming a pure growth, with fronds up to 1.25 m. long, no. 8009. See p. 382.

Apparently the first record from the Coastal Plain of Virginia.

DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore. SURRY COUNTY: beech woods, slopes of gully 1½ miles north of Surry, no. 8001. See p. 383.

Rare on the Coastal Plain of Virginia.

ADIANTUM PEDATUM L. Occasional in rich woods.

The colonies in the rich gullies at Claremont Wharf have stipes of unusual height (up to 6.5 dm.). See p. 383.

EQUISETUM HYEMALE L., var. AFFINE (Engelm.) A. A. Eaton. Extended eastward from Surry County to NANSEMOND COUNTY: marshes along Western Branch, Everett's Bridge, no. 7186.

LYCOPODIUM LUCIDULUM Michx. SOUTHAMPTON COUNTY: rich woods about 2½ miles east of Drewryville, no. 7746 (station discovered by our driver, *Meade Lewis*). See p. 375.

Very rare on the Coastal Plain; collected by Grimes near Williamsburg.

L. TRISTACHYUM Pursh. Extended south to SOUTHAMPTON COUNTY: dry sand, pine barrens about 7 miles south of Franklin, no. 7192.

POTAMOGETON CRISPUS L. SURRY COUNTY: brook in drained cypress swamp, Claremont Wharf, no. 7747.

*P. CAPILLACEUS Poir. NANSEMOND COUNTY: sandy and peaty margin of Norfleet Pond, northwest of Whaleyville, no. 7198. See p. 367.

SAGITTARIA GRAMINEA Michx. ISLE OF WIGHT COUNTY: abundant and chiefly immersed in Cat Pond, south of Benns Church, no. 7200. See p. 371.

Not cited from Virginia by J. G. Smith, Revis. N. Am. Sp. Sagittaria and Lophotocarpus (1894); but recorded from the Potomac in the Flora of the District of Columbia.

*ANACHARIS DENSA (Planch.) Victorin. DINWIDDIE COUNTY: dominant in argillaceous margin of millpond, Burgess, no. 7203. See p. 368.

BROMUS PURGANS L. Extended eastward to SURRY COUNTY: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8030; seen eastward to below Sunken Meadow Beach. See p. 382.

*GLYCERIA ARKANSANA Fernald. GREENSVILLE COUNTY: gum (*Nyssa aquatica*) swamp, bottomland of Metcalf Branch, east of Emporia, no. 8036. SURRY COUNTY: shallow water of gum swamp, Blackwater River, south of Savedge, no. 8037. Doubtless in other gum swamps. See p. 380.

Seemingly a very notable extension of rage. The last epitome, Hitchcock's Manual, cites *Glyceria arkansana* only from Louisiana, Arkansas and Texas. The lemmas, membranaceous, minutely scabrous-puberulent and very prominently veined, may reach a length of 4.3 mm. The ribbon-like blue-green leaves are very striking in being horizontally divergent. The panicle-branches are soon reflexed, giving the inflorescence the aspect of that of *Milium effusum*. As a matter of fact *G. arkansana* is now represented in the Gray Herbarium from western New York (Rhodora, xxxv. 294) and a sheet from northwest of Glencoe, Illinois (June 12, 1911, *Sherff*) seems to be it.

Poa Chapmaniana Scribn. Southampton County: weed in old cotton-field southwest of Franklin, no. 7750. Greensville County: similar habitat south of Emporia, no. 6941. See pp. 372, 373.

P. cuspidata Nutt. Rich woods generally, eastward to Surry County.

*Eragrostis peregrina Wieg. Caroline County: cinders of railroad ballast, Penola, no. 7207.

*Dactylis glomerata L., var. ciliata Peterm. Surry County: roadside, Claremont Wharf, no. 8043.

The extreme of the variety, with the lemmas dorsally pilose.

Arundo Donax L. Sussex County: a good colony, 3.5–4.5 m. high, in roadside-dump by a moist thicket, Wakefield, no. 7204.

Melica mutica Walt. Frequent in rich woodlands eastward to Dinwiddie and Greensville Counties, more local to Surry County (rich wooded slope at head of Sunken Meadow Creek, south of Claremont, no. 7755) and Nansemond County (wooded slope, Kilby, no. 6948).

Triplasis purpurea (Walt.) Chapm. Southampton County: dry sand, pine barrens about 7 miles south of Franklin, no. 7210. See p. 366.

The species chiefly coastal with us.

Elymus villosus Muhl. Surry County: rich calcareous wooded gullies by James River, Claremont Wharf, no. 8021; seen at Eastover. See p. 382.

E. villosus, forma arkansanus (Scribn. & Ball) Fernald. Surry County: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8022. See p. 382.

E. riparius Wieg. Greensville County: rich deciduous woods by Three Creek,[1] north of Emporia, no. 8023.

[1] Owing to the new trunk-line automobile-roads often departing from the old wagon-roads we mistook this station by Three Creek and many duplicates from there have been erroneously distributed as from Maclin's Creek, which is slightly more to the west.

HYSTRIX PATULA Moench. GREENSVILLE COUNTY: with the last, no. 8029. PRINCE GEORGE COUNTY: rich woods, Coggins Point, no. 8960. See p. 375.

DESCHAMPSIA FLEXUOSA (L.) Trin. SURRY COUNTY: rich wooded gullies along James River below Sunken Meadow Beach, no. 8049. See p. 382.

Our only station on the Coastal Plain of Virginia.

ALOPECURUS CAROLINIANUS Walt. Ditches, roadsides and old cotton-fields. SOUTHAMPTON COUNTY: Franklin, no. 7758; Haley's Bridge, no. 7759. GREENSVILLE COUNTY: south of Emporia, no. 6949. See p. 372.

MUHLENBERGIA CAPILLARIS (Lam.) Trin. SUSSEX COUNTY: dry hickory and oak woods near Burt, no. 7212.

BRACHYELYTRUM ERECTUM (Schreb.) Beauv. SURRY COUNTY: rich calcareous wooded gullies by James River, Claremont Wharf, no. 8052. See p. 382.

ARISTIDA DICHOTOMA Michx., var. CURTISSII Gray. CAROLINE COUNTY: roadside gravel south of Milford, no. 7214. SUSSEX COUNTY: roadside bordering dry hickory and oak woods near Burt, no. 7216. SOUTHAMPTON COUNTY: dry sand, pine barrens about 7 miles south of Franklin, no. 7215.

A. VIRGATA Trin. Extended inland to DINWIDDIE COUNTY (sphagnous bog about 1 mile northeast of Burgess, no. 7221) and SOUTHAMPTON COUNTY (pine barrens about 7 miles south of Franklin nos. 7218, 7219).

CTENIUM AROMATICUM (Walt.) Hitchc. SUSSEX COUNTY: sphagnous argillaceous boggy depression just northwest of Wakefield, no. 7224 (see p. 367). GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, no. 8550.

*DIGITARIA ISCHAEMUM (Schreb.) Muhl., var. MISSISSIPPIENSIS (Gattinger) Fernald. DINWIDDIE COUNTY: wet peaty clearing about 1 mile northeast of Burgess, no. 7229. See p. 369.

Recorded by Hitchcock (Man.) only from Maryland, Tennessee and South Carolina.

*D. SEROTINA (Walt.) Michx. SOUTHAMPTON COUNTY: wet siliceous and argillaceous drained border of Predler's Pond, Nottoway Swamp, southwest of Sedley, no. 7233. See p. 370.

The first from north of North Carolina, except old ballast-land collections from about Philadelphia.

PASPALUM DISSECTUM L. To the solitary station of a single individual previously reported add, also from SOUTHAMPTON COUNTY: wet siliceous and argillaceous drained border of Predler's Pond, Nottoway Swamp, southeast of Sedley, no. 7236; border of peaty pool in cypress-gum swamp, about 4 miles northeast of Capron, no. 7237. See p. 369.

*P. praecox Walt., var. Curtisianum (Steud.) Vasey (*P. lentiferum* Lam.). Sussex County: sphagnous siliceous boggy depression just northwest of Wakefield, no. 7241. See p. 367.

The first from north of North Carolina.

*Paspalum bifidum (Bertol.) Nash, var. **projectum**, var. nov. (tab. 509), planta 1–1.5 m. alta; culmo superne subnudo; foliis plerumque subbasilaribus, vaginis longe villosis; internodiis superioribus valde exsertis; racemis 2–3, inferioribus divergentibus vel divergenti-adscendentibus valde interruptis, rhachi puberulente; spiculis 3–3.2 mm. longis; gluma inferiora 0.6–1.5 mm. longa vel obsoleta, gluma superiore fructum excedens.—Virginia: dry pine woods east of Burt, Sussex County, September 20, 1937, *Fernald & Long*, no. 7239 (type in Gray Herb., isotypes in Herb. Phil. Acad. and elsewhere). See p. 372.

The remarkable *Paspalum bifidum*, forming a transition between true *Paspalum* and *Panicum*, with its spikelets plump and several-ribbed and with some of the 1st glumes well developed as in *Panicum* but with the spikelets paired on the rachis and some of them without 1st glumes as in *Paspalum*, is, as expressed by Mrs. Chase, "nowhere common, on the Coastal Plain from [southern] South Carolina to Texas" (Chase, N. A. Sp. Pasp. 234). It is clearly an ancient type, now persisting as a relic. The plant of southeastern Virginia, isolated by 325 miles from the northeastern area of true *P. bifidum*, has all the anomalous characters of that species but departs in some points from all the more southern specimens (14 nos.) before me.

Typical *P. bifidum* may have the sheaths villous or rarely glabrous but in only one specimen (*Buckley* from Alabama) is the pubescence so extremely developed as in the Virginia plant. In true *P. bifidum* the upper node is strongly overtopped by the subtending leaf; in var. *projectum* it is 5–16 cm. above the tip of its subtending leaf. In true *P. bifidum* the uppermost blade is 2.5–18 cm. long, with the lowermost raceme borne from below it to only 2 (rarely 3) dm. above it; in var. *projectum* the uppermost blade is only 1–3 (rarely –7) cm. long, with the lowermost raceme 2.5–4.5 dm. above it. In true *P. bifidum* the 2–6 racemes are strongly ascending, often even appressed-suberect, and but slightly interrupted. In var. *projectum* the 2 or 3 racemes are much more interrupted and the lower divergently ascending or even strongly divergent, though in age quite as appressed as in the southern plant. In true *P. bifidum* the rachis of the raceme has scabrous angles, in var. *projectum* it is more universally puberu-

lent. The spikelet of *P. bifidum* is 3.3– barely 4 mm. long, that of the variety 4–4.2 mm. long. In *P. bifidum* the 1st glume, when developed, is broadly deltoid to rounded and only 0.3–0.6 mm. long; in the variety it is narrower and more elongate, 0.6–1.5 mm. long. In *P. bifidum* the fruit projects beyond the 2nd glume; in the variety it is covered.

Such a series of differences might seem to indicate specific separation but, although the aggregate of differential characters is striking, their stability is less so. It seems to me better to consider the plant of Virginia a geographic variety.

*Panicum chrysopsidifolium Nash. Southampton County: border of sandy woods, Hart's Bridge, no. 8080, very large (up to 8 dm. high) with larger panicles 9 cm. long; dry sandy open pine and oak woods, 6 to 7 miles south of Franklin, no. 8069, small plants (1.7–3 dm. high) with panicles only 2–3 cm. long. See p 378.

Not recorded by Hitchcock (Man.) from north of Florida but collected by Wiegand & Manning in North Carolina in June and July, 1927 (sandy roadside near swale, west of Wilmington, no. 216; sandy roadside bank, 8 miles south of Williamstown, Martin County, no. 215).

P. spretum Schultes. York County: borders of small pond-holes in woods, northeast of Grafton, no. 7255. Surry County: peaty depression in woods, east of Eastover, no. 8568. Greensville County: wet cut-over sphagnous pine and oak woods near mouth of Three Creek, north of Emporia, no. 8073; *Cephalanthus* swamp about 1 mile north of Skipper's, no. 8569. See p. 371.

The York County station important, since the species was not seen by Grimes.

P. Wrightianum Scribn. Southampton County: old cart-road in swampy woods and clearings southeast of Ivor, no. 7257; border of peaty pool in cypress-gum swamp, about 4 miles northeast of Capron, no. 7258.

P. Commonsianum Ashe. Southampton County: dry sand, pine barrens about 7 miles south of Franklin, abundant and variable, nos. 7264–7268.

P. mutabile Scribn. & Smith. Additional station in Southampton County: moist peaty and sandy depressions in pine barrens, about 7 miles south of Franklin, no. 7277.

P. amarum Ell. A species of coastal sands extending up the James to Surry County: sandy beach of James River, Claremont Wharf, nos. 8057, 8948.

P. agrostoides Spreng. The typical form (see Rhodora, xxxviii.

390) from Southampton County: wet siliceous and argillaceous drained border of Predler's Pond, Nottoway Swamp, southwest of Sedley, no. 7284. York County: borders of small pond-holes in woods, northwest of Grafton, no. 7285. See pp. 369, 371.

P. agrostoides, var. condensum (Nash) Fernald. York County: borders of small pond-holes in woods, northwest of Grafton, no. 7286.

P. rhizomatum Hitchc. & Chase *P. anceps* var. Fernald. Inland, locally, to Southampton County (moist peaty and sandy depressions in pine barrens, about 7 miles south of Franklin, no. 7291) and Sussex County (swampy woods southeast of Waverly, no. 7292).

P. hians Ell. Add to stations in Southampton County: alluvial woods, bottomland of Meherrin River, near Haley's Bridge, no. 8054. Greensville County: clay-bottomed shallow pool near Fontaine Creek, west of Dahlia, no. 8578.

P. hemitomon Schultes. To the station reported in Sussex County add one in Isle of Wight County: sandy and peaty border of Cat Pond, south of Benns Church, nos. 7293, 8056. See p. 371.

Sacciolepis striata (L.) Nash. Inland to Dinwiddie County: argillaceous border of millpond, Burgess, no. 7294.

Setaria magna Griseb. York County: along ditch, border of saltmarsh northwest of Yorktown, no. 7296. See p. 372.

Not recorded by Grimes.

*Cenchrus incertus M. A. Curtis. Nansemond County: sandy field by Nansemond River, Suffolk, no. 7298. Isle of Wight County: dry sandy roadside at crossing of Southern Railroad, Lee's Mill, no. 6505. Southampton County: "soft shoulder" of road bordering bottomland of Blackwater River, southeast of Ivor, no. 6025.

An unfortunate extension northward into Virginia.

*Erianthus strictus Baldw. Sussex County: depression in pinelands just southeast of Waverly, no. 7299; exsiccated argillaceous pineland about 2 miles east of Stony Creek, no. 8918. Southampton County: clearing at border of sandy woods, Terrapin Ridge, east of Drewryville, no. 8917. Prince George County: swampy clearing just southeast of Disputanta, no. 8581. York County: borders of small pond-holes in woods, northwest of Grafton, no. 7300. See p. 371.

Extension north from North Carolina.

E. compactus Nash. Sussex County: sphagnous argillaceous boggy depression just northwest of Wakefield, no. 7303. See p. 367.

Seems abundantly distinct from the common *E. giganteus*. We have seen it nowhere else in Virginia.

*E. brevibarbis Michx. Sussex County: peaty swale (cut-over cypress swamp), about 4 miles northwest of Homeville, no. 7301.

Apparently true *E. brevibarbis* is a very rare plant.

SORGHASTRUM ELLIOTTII (Mohr) Nash. Inland to SOUTHAMPTON COUNTY: dry sand, pine barrens about 7 miles south of Franklin, no. 7312; and SUSSEX COUNTY: dry hickory and oak woods near Burt, no. 7314; north to YORK COUNTY: dry open woods northwest of Tabb's, no. 7313.

CYPERUS GLOBULOSUS Aubl. SOUTHAMPTON COUNTY: grassy roadside about 7 miles south of Franklin, no. 7324.

ELEOCHARIS ENGELMANNI Steud. YORK COUNTY: swale southeast of Tabb's, no. 8586. SURRY COUNTY: low wood-road north of Savedge, no. 8101; wet clearing west of Claremont, no. 8975. GREENSVILLE COUNTY: clay-bottomed pool by Fontaine Creek, west of Dahlia, no. 8585.

*E. MELANOCARPA Torr. ISLE OF WIGHT COUNTY: sandy and peaty border of Cat Pond, south of Benns Church, nos. 7338, 8104, 8589. See p. 371.

First station between Georgia and New Jersey. See p. 371.

*E. TRICOSTATA Torr. ISLE OF WIGHT COUNTY: sandy and peaty border of Cat Pond, south of Benns Church, nos. 7339, 8100 and 8102. GLOUCESTER COUNTY: sphagnum-carpeted pool in woods, south of White Marsh, no. 8590. See p. 371.

Not seen by Svenson (see p. 371) from between Georgia and New Jersey; but recorded by Weatherby and Griscom from eastern South Carolina (see RHODORA, xxxvi. 38).

*E. CAPITATA (L.) R. Br., var. VERRUCOSA Svenson in RHODORA, xxxiv. 202 (1932). DINWIDDIE COUNTY: wet argillaceous depressions south of Petersburg, no. 8103. See p. 378.

Very notable occurrence. Svenson cites the variety as occurring from southern Indiana and Illinois to Arkansas and Oklahoma. A recent collection shows it to reach Louisiana.

*BULBOSTYLIS **ciliatifolius** (Ell.), comb. nov. *Scirpus ciliatifolius* Ell. Sk. i. 82 (1816). *Isolepis ciliatifolius* (Ell.) Torr. in Ann. Lyc. N. Y. iii. 352 (1836). *Stenophyllus ciliatifolius* (Ell.) Mohr in Bull. Torr. Bot. Cl. xxiv. 22 (1897). SOUTHAMPTON COUNTY: dry sand, pine barrens about 7 miles south of Franklin, no. 7340; dry sandy old clearing, north of Smith's Ferry on the Nottoway River, no. 8591. See p. 366.

The conservation of *Bulbostylis* Kunth ? (1837) over *Stenophyllus* Raf. (1825) makes necessary this and other transfers.[1] *B. ciliatifolius* has not previously been known north of North Carolina.

[1] BULBOSTYLIS **stenophyllus** (Ell.), comb. nov. *Scirpus stenophyllus* Ell. Sk. Bot. S. C. and Ga. i. 83 (1816). *Dichroma caespitosa* Muhl. Gram. 14 (1817). *Stenophyllus caespitosus* (Muhl.) Raf. Neog. 4 (1825). *Isolepis stenophylla* (Ell.) Torr. in Ann.

As stated, *Bulbostylis* of somebody has been conserved in the International Rules of Botanical Nomenclature, as readjusted at Cambridge and thereafter (ed. 3: 132, no. 471 partim).

*Bulbostylis Kunth. Enum. Pl. II. (1837) 205. [Nom. conserv.]	Stenophyllus Raf. Neogen. (1825) 4. [Nom. rejic.]

The conservation is effected through the use of the asterisk, which is said to mean that a majority of the Committee appointed at Cambridge, of whom the present writer was (in this instance) in the minority, had voted for it. Now the least bit of bibliographic investigation will show that Kunth DID NOT properly publish *Bulbostylis* as a genus which he himself accepted. In his treatment of the genus *Isolepis*, he split that genus into four main divisions: "1) Species legitimae" (p. 187); "2) Species parum anomalae" (p. 202); "3) Species alienae, genus proprium (BULBOSTYLEM) inter Isolepidem et Fimbristylem constituentes. Stylus tri-, rarissime bifidus, basi bulboso-incrassatis. Achenium basi styli persistente tuberculatum" (p. 205); and (p. 214) "Species a me haud visae, affinitate dubiae." The species under divisions 1 and 2 number 56, all called *Isolepis*. After the definition of division 3, the numbering of species goes straight on, from 57 to 82, and every specific name is preceded by the initial I (for *Isolepis*), like all which precede it. Although Kunth made the gesture of suggesting *Bulbostylis* (name already twice used in two separate families) as a genus, he did not have sufficient conviction to call the species under it by that name but left them unequivocally as *Isolepis*. Furthermore, even those who maintain that *Bulbostylis* Kunth (1837) is a properly published genus must admit that it was antedated by the really unequivocal *Stenophyllus* Rafinesque (1825). By Art. 60 of the International Rules *Bulbostylis* Kunth was illegitimate (it was also illegitimate under Art. 61, because it is a *later homonym* on two counts). Art. 60, in part, reads "A name is illegitimate in the following cases. (1) If it was superfluous when published, i.e. if there was a valid name

---

Lyc. N. Y. iii. 353 (1836). *Stenophyllus stenophyllus* Britton in Bull. Torr. Bot. Cl. xxi. 30 (1894).

B. **coarctatus** (Ell.), comb. nov. *Scirpus coarctatus* Ell. Sk. Bot. S. C. and Ga. i. 83 (1816). *Isolepis coarctata* (Ell.) Torr. in Ann. Lyc. N. Y. iii. 353 (1836). *Stenophyllus coarctatus* (Ell.) Britton in Small, Fl. Se. U. S. 189, 1327 (1903).

B. **floridanus** (Britton), comb. nov. *Stenophyllus floridanus* Britton in Nash in Bull. Torr. Bot. Cl. xxii. 161 (1895).

B. **antillanus** (Britton), comb. nov. *Stenophyllus antillanus* Britton in Bull. Torr. Bot. Cl. xliii. 447 (1916).

B. **portoricensis** (Britton), comb. nov. *Stenophyllus portoricensis* Britton in Torreya, xiii. 216 (1913).

B. **nesioticus** (I. M. Johnston), comb. nov. *Stenophyllus nesioticus* I. M. Johnston in Univ. Calif. Pub. Bot. vii. 438 (1922).

Not to be confused with *Bulbostylis nesiotis* (Hemsl.) C. B. Clarke.

for the group to which its was applied, with its particular circumscription, position and rank." Then follow illustrations. *Stenophyllus* Raf. (1825) consisted of the one species, *S. caespitosus* Raf., a renaming of *Scirpus stenophyllus* Elliott. Division 3 of Kunth's treatment of *Isolepis* (his *Bulbostylis*) also included *I. stenophylla*, based upon *Scirpus stenophyllus*. Kunth's name was, therefore, doubly (or trebly) illegitimate.

The situation is closely parallel to that of *Atropis* and *Puccinellia*, except that *Atropis* was neither a later homonym nor illegitimate for the reason that it contained a group already legitimately named.[1] Ruprecht, under *Poa*, had sectional or subgeneric names: "Poa (Phippsia) algida (R. Br.)," "Poa (Catabrosa) airoides Koel.", "Poa (Atropis) distans L.," etc.; and at the end of the treatment he said "Atropis Trin. (P. distans) Catabrosae quoad glumas proxima, spiculas habet (saltem in statu virgineo) lineares, fere teretes; in Arctophila nostra semper ex ovato-oblongae vel lanceolatae. E conditione glumarum generum series fortasse sequens: Dupontia, Arctophila, Poa, Atropis," etc. *Atropis*, AS A GENUS, was not properly published until taken up and actually used as a genus by Grisebach in 1853. In 1848 *Puccinellia* Parl. was legitimately published as a genus, including *P. distans*, which had been the basis of Ruprecht's provisional genus *Atropis*. Therefore, in the same list which conserves "Bulbostylis Kunth, Enum. Pl. II. (1837) 205," *Atropis* (a parallel case and definitely called a "nomen provisorium" which is illegitimate) is properly rejected and *Puccinellia* properly conserved. As a genus, unequivocally so treated, *Bulbostylis* was apparently first taken up by C. B. Clarke (in Hook. f. Fl. Brit. Ind.) in 1893. In the meantime *Stenophyllus* Raf., properly published in 1825, had been revived and correctly used by Britton in 1891. By a singular reversal of logic, in the list which properly conserves *Puccinellia* over *Atropis*, the name of the doubtfully published genus, *Bulbostylis*, dated incorrectly from Kunth's questionable publication in 1837, instead of from Clarke's (or some other) definite one, is conserved, in spite of its treble illegitimacy, over the adequately published and wholly legitimate *Stenophyllus* Raf. (1825). This, of course, was done because the name *Bulbostylis* had been more generally used than had *Stenophyllus*, a perfectly valid reason; the trouble is the bibliographic

[1] For discussions of the situation see Fernald & Weatherby in RHODORA, xviii. 1, 2 (1916) and Fernald, ibid, xxviii. 150, 151 (1926).

one. Since it is requisite to good sportsmanship as well as statesmanship for the minority to accept the decision of the majority, I take up *Bulbostylis*, although I am still undecided about its authorship (perhaps those who urged its conservation can clarify that point). In taking up *Bulbostylis* I endeavor not to tuck the tip of my tongue into my cheek nor smilingly to remember the "Guiding Principle" of botanical nomenclature (Chap. I, Art. 3): "The rules of nomenclature should be simple and founded on considerations sufficiently clear and forcible for everyone to comprehend and be disposed to accept." The original Article 3 stated also that they "should neither be arbitrary nor imposed by authority." In some way this clause got lost in the rewriting.

The Varieties of Bulbostylis capillaris (Plate 510). The commonest and most wide-spread species in eastern North America is *Bulbostylis capillaris*, based upon *Scirpus capillaris* L. Sp. Pl. i. 49 (1753). This much is clear; otherwise the history of the name and the taxonomic and geographic limits of *B. capillaris* are perplexingly vague. The name is used in most parts of the warm regions of the world for something; until the whole group is intelligently and cautiously studied the specific limits can hardly be stated. The present study is restricted to the variable plant of temperate eastern North America.

Scirpus capillaris L. was itself a confused concept. It was published with an original diagnosis, based upon a specimen in Linnaeus's own herbarium, and quotations from his Hortus Cliffortianus and Flora Zeylanica, as well as others from Plukenet and Burman, with "*Habitat in* Virginia, Aethiopia, Zeylona," a sufficiently cosmopolitan range. I am quite unfitted to place all the elements myself. The plant of Ceylon, as shown by Burman's figure, cited by Linnaeus, has nothing to do with the plants of Virginia and of Ethiopia; it is, according to Sir Joseph Hooker in Trim. Fl. Ceylon, v. 66 (1900) *B. barbata* (R. Br.) C. B. Clarke (wrongly ascribed to Kunth). The Ethiopian plant, *Gramen junceum perpusillum; capillaceis foliis, aethiopicum* of Plunkenet, as shown by his plate, is certainly not a *Bulbostylis*. Without fuller knowledge of the plant actually before Linnaeus when he published his Hortus Cliffortianus it is not possible to say just what Linnaeus then had, but his plant (or plants) came from Jamaica and he cited the Ethiopian plant of Plukenet and a plate of Sloane's which represents some species of *Bulbostylis* but

not the plant of Virginia. The latter, which alone was in the Linnean herbarium when Species Plantarum was being prepared, is a well-preserved specimen and must stand as the TYPE of *Scirpus capillaris*. The photograph of it, most generously supplied me by Mr. Savage, shows it to be the extreme of our North American species which I described as *Stenophyllus capillaris* var. *pycnostachys* Fernald in RHODORA, xix. 154 (1917). Two other varieties of the species occur in the eastern United States. It is presumable that in the specific synonomy names for them might be found; as varieties they do not require names which were given as binomials and, in view of the very confused condition of the genus, it is wiser to assign unequivocal names and types to all three. As I see *Bulbostylis capillaris* it consists of

BULBOSTYLIS CAPILLARIS (L.) C. B. Clarke[1] in Hook. f. Fl. Brit. Ind. vi. 652 (1893), as to type only, the name erroneously ascribed to Kunth. *Scirpus capillaris* L. Sp. Pl. i. 49 (1753), as to new diagnosis and type-specimen in Herb. Linn. (our FIG. 1). *Isolepis capillaris* (L.) R. & S., Syst. ii. 118 (1817). *Fimbristylis capillaris* (L.) Gray, Man. 530 (1848). *Stenophyllus capillaris* (L.) Britton in Bull. Torr Bot. Cl. xxi. 30 (1894). *S. capillaris*, var. *pycnostachys* Fernald in RHODORA xix. 154 (1917).—Plant bearing crowded sessile spikelets at the bases of the leaves; spikelets of the terminal umbel rather crowded, 3–10 mm. long, longer than their pedicels.—Southern Maine to Minnesota, south to Virginia and Missouri. FIG. 1, TYPE of *B. capillaris*, × 1; FIG. 2, base from TYPE of var. *pycnostachys*, × 2; FIG. 3, inflorescences of the latter, × 1.

Var. **crebra,** var. nov. (TAB. 510, FIG. 4 et 5), spiculis basilaribus sessilibus nullis; umbellae spiculis lateralibus 2.5–6 mm. longis breviter pedicellatis, pedicellis inaequalibus 0.1–1 cm. longis.—Maine to Nebraska, south to Georgia, Tennessee, Oklahoma and Texas. TYPE: Muddy Pond, Stony Brook Reservation, MASSACHUSETTS, August 22, 1912, *G. G. Kennedy* (Herb. Gray). FIG. 4, portion of TYPE, × 1; FIG. 5, portion of base × 2.

*Var. **isopoda,** var. nov. (TAB. 510, FIG. 6), spiculis basilaribus sessilibus nullis; umbellae spiculis subaequaliter pedicellatis 2.5–9 mm. longis, pedicellis plerumque 0.6–3 cm. longis.—Maryland to southern Illinois, south to Georgia, Alabama, Arkansas and Texas.

[1] Index Kewensis assigns the specific combination to Nees in Mart. Fl. Bras. ii[1]. 84, in obs. Reference to the treatment of Nees (1842) shows that, describing a new species under the generic name *Oncostylis* he compared it with "*Bulbostylis capillaris*" (name undefined and its source not given). Nees was using the generic name *Oncostylis* and he loosely cited herbarium-names ("*Bulbostylis paradoxa N. ab E. in Herb. Caes. Vindob. n. 89,*" "*Bulbostylis tenuifolius N. ab E. in Herb. Caes. Vindob.*", etc.) as synonyms. Such names, of course, have no status in nomenclature. Nees was not taking up *Bulbostylis* as a genus; he gave the case away (p. 85) by correctly citing "*Isolepis* (*Bulbostylis*) *Langsdorffii Kunth. En. II. 214.*"

Type: wet sand of dune-hollows, south of False Cape, Princess Anne County, Virginia, *Fernald & Long*, no. 3737 (in Herb. Gray). Fig. 6, inflorescences of the type, × 1.

*Scirpus fontinalis Harper. Surry County: calcareous meadow near head of Sunken Meadow Creek, south of Claremont, no. 7761; abundant along rills in rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8108. Beginning to flower in early April; fruit dropping in early June. See pp. 376, 381, 382.

A remarkable range-extension but one of a type now becoming familiar. The very distinct and almost showy *Scirpus fontinalis* was discovered by Harper about a reputedly calcareous spring-fed shaded pool in Sumter County, Georgia. It has apparently not been known outside of Georgia. The Virginia area is in the calcareous fossil belt of Surry County, an extensive colony, the plant abundant all along the woodland rills and persisting by their margins on the cleared meadows.

*Scirpus atrovirens Muhl., var. **flaccidifolius**, var. nov., planta flaccida reclinata vel valde arcuata; rhizomate elongato; culmo solitario arcuato vel reclinato; foliis submembranaceis flaccidis translucentibus basi membranaceis planis; paniculis umbelliformibus laxis; spiculis ovoideis 3–4 mm. longis; perianthii setis achaeniis subaequantibus.—Southampton County, Virginia: wooded alluvial bottomland of Meherrin River, near Haley's Bridge, June 16, 1938, *Fernald & Long*, no. 8109 (type in Herb. Gray; isotype in Herb. Phil. Acad.). See p. 376.

Scirpus atrovirens, in its typical form, and var. *georgianus* (Harper) Fernald (*S. georgianus* Harper) both grow as erect stools with usually several stiff culms. Typical *S. atrovirens* has the leaves firm and opaque, the sheaths of the lower superficially nodulose-septate, the ovoid to cylindric spikelets 3.5–8 mm. long, the achenes overtopped by the perianth. In var. *georgianus* the firm and opaque leaves have smooth (not superficially nodulose) sheaths, the spikelets are 2–4 mm. long and the perianth is wanting or very short. Var. *flaccidifolius* differs from them both in its non-cespitose habit, weak culm, and membranous and translucent leaves. It has the lower sheaths smooth, as in var. *georgianus*, the spikelets broader than in most material of either that or typical *S. atrovirens*, and the long perianth of the latter.

The Type of Fuirena squarrosa.—Two species of *Fuirena* occur in the northeastern United States—from Virginia northward. They are readily separated as follows:

No. 1. Annual, tufted, with culms 0.5–4.5 dm. high, often depressed; olivaceous scales of spikelets delicately nerved, with strongly curving awns; perianth-scales narrowly to broadly oblong or ovate, attenuate to a long retrorsely barbed awn; barbed bristles usually exceeding the yellow-brown achene, which is equaled by the persistent style. *F. pumila* Torr.; *F. squarrosa* of recent American authors.—Bogs and wet peaty or sandy shores, Florida to Massachusetts; southern Michigan and northwestern Indiana.

No. 2. Perennial, with thick rhizome; culms 0.25–1 m. high, erect; scales of spikelet with coarsely corrugated center and straight or but slightly curving awns; perianth-scales rhombic or deltoid-ovate, blunt or with a short thick smooth terminal subulus, the interposed mostly barbless bristles shorter than the yellow achene, which is twice as long as the persistent style. *F. hispida* Ell.—Wet sandy places, Florida to Texas, north to New Jersey, Kentucky and Oklahoma; also West Indies.

By the earlier American botanists the two were not generally specifically separated or were considered varieties of one specific type which, naturally, took the earliest name, *F. squarrosa* Michx. Fl. Bor.-Am. i. 37 (1803); but they are now generally recognized as quite definite species. Unfortunately, when, in recent years, the two were set apart as species insufficient care was taken in determining to which Michaux's name applied. In his *Revision of the United States Species of the Genus Fuirena*, Bull. Torr. Bot. Cl. xvii. 1–8 (1890), Coville was misled by assuming that Michaux's type is at Kew, rather than in Paris. Coville said:

"By the kindness of Mr. C. B. Clarke of the Royal Herbarium at Kew, I have been able to ascertain that this [our no. 1] is the typical form of Michaux's *F. squarrosa*. He writes 'Our original specimen of Michaux named *squarrosa* is the slender plant 6 to 8 inches high with fibrous roots, in short = *simplex* Vahl. var. *pumila* sp. Spreng.' " (Coville, p. 6).

Unhappily, however, the types of Michaux's *Flora Boreali-Americana* can hardly be assumed to be at Kew. They are generally known to be in Paris. Michaux's plant from Georgia and Carolina had the technical characters of our no. 2 and was so described by him: "paleis pistillinis petiolata-spathulatis, muticis; interjectis totidem setulis brevibus," characters which keep it out of our no. 1. Incidentally Coville, citing the specimens examined by him, enumerated none of our no. 1, which he took for true *F. squarrosa*, from Georgia and South Carolina, but our no. 2, *F. hispida* Ell., with the technical characters of Michaux's diagnosis of *F. squarrosa*, was cited from both Georgia and South Carolina. Fortunately, the beautiful photograph of the material in the Michaux Herbarium at the Muséum National d'Histoire Naturelle, kindly sent to me by Professor Humbert and M.

Metman, beautifully displays our no. 2, so that there is no reason longer to perpetuate the error which arose when Clarke inferred that a specimen at Kew is typical. *F. hispida* Ell. (1821) must go into the synonymy of F. SQUARROSA Michx. (1803).

The smaller annual species (our no. 1), which has erroneously passed as *F. squarrosa* is F. PUMILA Torr. ex Spreng. Syst. i. 237 (1825). Torrey in 1826, without referring to Sprengel's publication of his *F. pumila*, treated *F. squarrosa* as the tall plant of the South, the smaller being called by him *F. squarrosa*, β *pumila*, Compend. Fl. N. Mid. St. 46 (1826).

As to the name "*simplex* Vahl. var. *pumila* sp. Spreng.," apparently coined by Clarke in the hope of clarifying the situation, it is apparently a new combination, but made without proper bibliographic citations.

RHYNCHOSPORA WRIGHTIANA Boeckel. DINWIDDIE COUNTY: wet peaty clearing about 1 mile northeast of Burgess, no. 7355. SOUTHAMPTON COUNTY: peaty and argillaceous clearing in pineland east of Courtland, no. 8119. PRINCE GEORGE COUNTY: wet pineland south of Petersburg, no. 8602. ISLE OF WIGHT COUNTY: sphagnous border of Cat Pond, south of Benns Church, no. 8118.

R. CYMOSA Ell., var. GLOBULARIS Chapm. Frequent inland to DINWIDDIE and GREENSVILLE COUNTIES.

R. HARVEYI W. Boott. DINWIDDIE COUNTY: sphagnous border of spring-fed pond at Century House, northeast of Burgess, no. 8116; pineland at west side of Wilcox Lake, Petersburg, no. 8596. SUSSEX COUNTY: peaty swale and open wooded swamp 3½ to 4 miles northeast of Homeville, no. 8111; peaty and argillaceous swale north of Littleton, nos. 8112, 8113.

Readily distinguished from the common *R. cymosa* by the acute flange at the base of the tubercle. In habit similar to, but the inflorescence more flexuous and without the prominent, stiff involucre of, *R. cymosa*. Presumably overlooked because of its early maturing. The single small collection made in Prince George County in 1936 was in mature fruit on June 19, and later in the summer we did not find it. Our collections of 1938 were fully mature as early as June 8.

R. FASCICULARIS (Michx.) Vahl. GREENSVILLE COUNTY; depressions in dry open sandy pine and oak thickets near the Sussex County line, north of Emporia, no. 8114.

Previous Virginian records only from Princess Anne County.

*R. PERPLEXA Britton. DINWIDDIE COUNTY: wet argillaceous depression south of Petersburg, no. 8603. SUSSEX COUNTY: wet

peaty depression in pineland 3 to 4 miles northwest of Waverly, no. 8115. See p. 381.

First from north of North Carolina. The Waverly station, a small depression, on June 12, 1938, full of water, is one with many localized species. *Rhynchospora perplexa*, fully mature and with ripe achenes dropping on that date, superficially resembles *R. Torreyana*, with which it grows and which was hardly in anthesis. Its inflorescence is fuller and darker, the small castaneous spikelets sessile or subsessile in small fascicles and the achenes smaller and broader. It has presumably been overlooked because of its early maturing.

SCLERIA OLIGANTHA Michx. SUSSEX COUNTY: border of wooded bottomland of Nottoway River, east of Stony Creek, no. 8123. GREENSVILLE COUNTY: rich deciduous woods by Metcalf Branch, east of Emporia, no. 8124; and noted at other stations. Presumably overlooked because of its early maturing.

CAREX VULPINOIDEA Michx.

The plants on the wooded bottomland of the Meherrin River, near Haley's Bridge, are of a dark blue-green color, rather than the usual yellow-green; but they seem to show no morphological differences. See p. 376.

C. BROMOIDES Schkuhr. SURRY COUNTY: by brook in drained cypress swamp, Claremont Wharf, nos. 7762, 7763. See p. 382.

Not seen elsewhere by us on the Coastal Plain. No. 7763, growing in loose litter, shows the rhizome somewhat elongate, an unusual tendency in the species.

*C. PENSYLVANICA Lam. ISLE OF WIGHT COUNTY: sandy pine barrens, south of Zuni, no. 7773. See p. 374.

Not seen by Mackenzie (N. Am. Fl.) from the state.

*C. UMBELLATA Schkuhr (*C. abdita* Bickn.). BRUNSWICK COUNTY: rich wooded slope by Meherrin River, 8 miles southeast of Cochran, no. 6953. SUSSEX COUNTY: rich wooded slope, 4 miles south of Stony Creek, no. 6952. ISLE OF WIGHT COUNTY: dry sandy yellow pine and oak woods near Walters, no. 7775. See p. 374.

Not seen by Mackenzie (N. Am. Fl.) from south of the District of Columbia.

*C. TONSA (Fern.) Bicknell. ISLE OF WIGHT COUNTY: sandy pine barrens, south of Zuni, no. 7774. SOUTHAMPTON COUNTY: open sandy woods and thickets, Cypress Bridge, no. 6951. See p. 374.

Not seen by Mackenzie (N. Am. Fl.) from south of the District of Columbia.

*Carex digitalis Willd., var. **macropoda**, var. nov. (tab. 511, fig. 3 et 4), planta dense cespitosa, culmis foliisque suberectis 3–6 dm. altis; spicis masculis longe pedunculatis pedunculis plerumque 0.5–2 dm. longis; spicis foemineis longe pedunculatis pedunculis imis 4–10 cm. longis.—Maryland and southern Indiana, south to North Carolina and Louisiana. Maryland: damp rocky woods along the Potomac, southeast of Great Falls, June 11, 1904, *Agnes Chase*, no. 2301. Virginia: Richmond, May 9, 1894, *J. R. Churchill;* rich woods, Great Neck, Princess Anne County, May 5, 1935, *Fernald & Griscom*, no. 4332, noted as having "exceptionally long staminate peduncles"; dry rich woods near Metcalf Branch, east of Emporia, April 8, 1938, *Fernald & Long*, no. 7767 (type in Gray Herb., isotype in Herb. Phil. Acad.); dry wooded slopes by Three Creek, Drewryville, April 9, 1938, *Fernald & Long*, no. 7768; rich wooded slope near Applewhite Church, Southampton County, April 9, 1938, *Fernald & Long*, no. 7769; rich deciduous woods northeast of Statesville, Southampton County, June 16, 1938, *Fernald & Long*, no. 8147; rich wooded slope, South Quay, Nansemond County, June 19, 1938, *Fernald & Long*, no. 8148. North Carolina: Wilmington, *M. A. Curtis.* Indiana: wooded slope about 5 miles southeast of Englis, Crawford County, June 9, 1919, *Deam*, no. 27,837; wooded slope of the Van Buren Ridge, about 8 miles southeast of Cannelton, Perry County, April 24, 1919, *Deam*, no. 27,119. Louisiana: dry woods, April, ——, Red River, *Hale.*

Var. *macropoda*, noted by Griscom and me (see p. 374), when we first found it in 1935, on account of its very long staminate peduncles, is the only variation of *Carex digitalis* known to us from the Coastal Plain of Virginia, although it doubtless overlaps into the Piedmont area of the state. Its occurrence at Wilmington, North Carolina, in Louisiana and in the lower Ohio drainage in southern Indiana suggests that it is an austro-riparian extreme, which will be found in other southeastern states. Typical wide-spread *C. digitalis* (figs. 1 and 2) is usually low, with loosely spreading or arching culms (0.5–5 dm. high), the staminate spike approximate to the upper pistillate spike or to the uppermost bract or on a peduncle rising 0.2–3(–4.5) cm. above the bract or pistillate spike, the inflorescence frequently overtopped by the leafy median bract. Its pistillate spikes are short- to long-stalked, the uppermost even subsessile, but the lower peduncles are rarely so long as in var. *macropoda*. Var. *macropoda* is at once distinguished by its strongly erect habit, the heavy almost coralline-branched cespitose base, the long peduncles and the relatively short bracts, the staminate spikes rising high beyond them.

The name *Carex digitalis*, forma *podostachys* (Steud.) Kükenthal in

Photo. H. G. Fernald.

CAREX DIGITALIS: FIGS. 1 and 2, inflorescences, × 1.
Var. MACROPODA: FIG. 3, type, × $^{2}/_{5}$; FIG. 4, inflorescence, × 1.

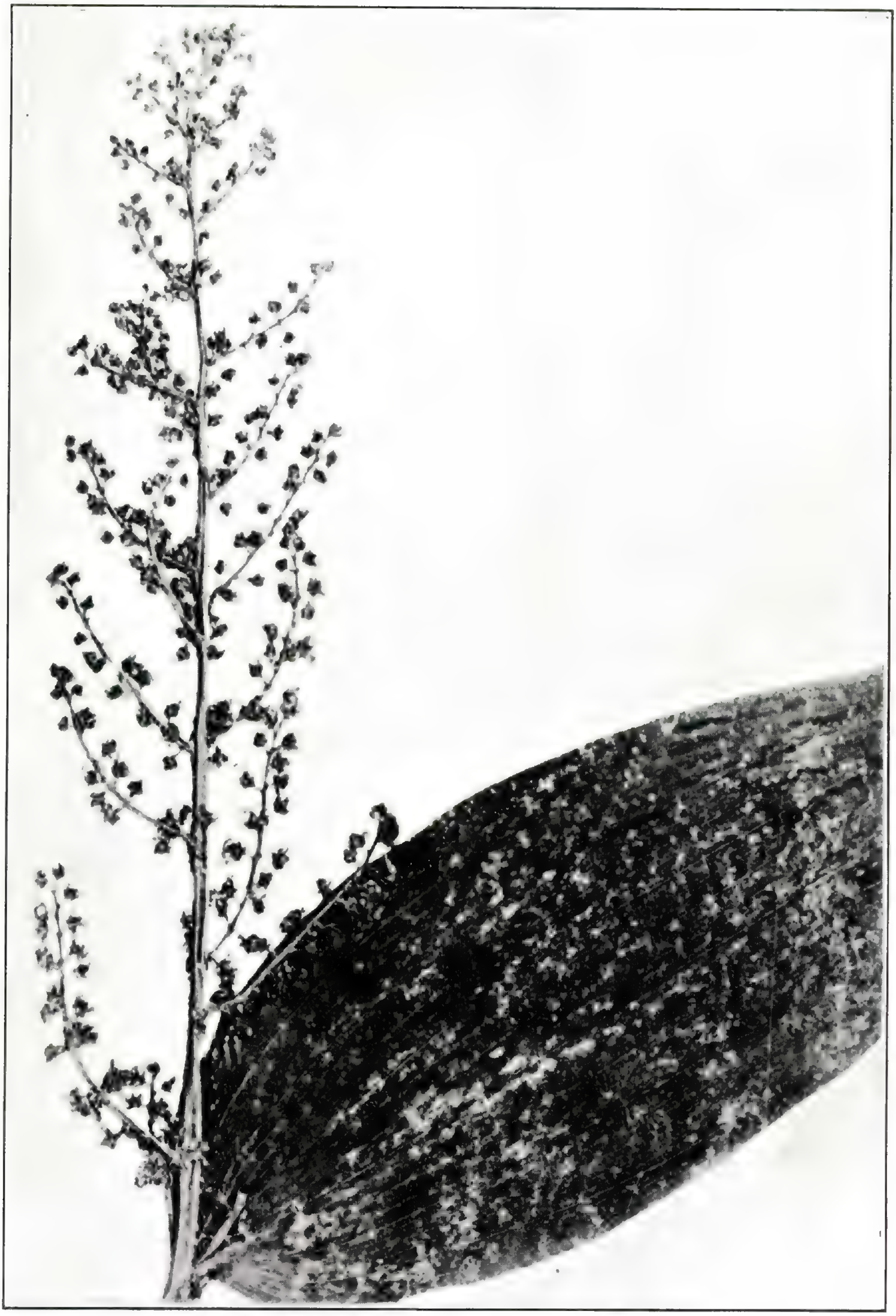


Photo. H. G. Fernald.

SMILACINA RACEMOSA, var. TYPICA: TYPE, × 1, of *Convallaria racemosa* L. in Clifford Herbarium (courtesy of Mr. JOHN RAMSBOTTOM).

Engler, Pflanzenr. iv[20]. 528 (1909), based on *C. podostachys* Steud. Syn. Cyp. 232 (1855), suggests that Steudel might have had var. *macropoda* before him from New Orleans. I have not seen Steudel's type but his plant was only 4–7 inches high, with "spica suprema mascula tenui solitaria plerumque foemineae primae approximata," suggesting ordinary *C. digitalis;* but the "foliis . . . lanceolatis" and spicis "foemineis . . . ex axillis infimis foliorum in pedunculo capillari filiformi culmum plus minusve aequante . . . pauci (sub-5-)floris," as well as the "utriculis . . . obtusiusculis" suggest that *C. podostachys* may not belong with *C. digitalis.* At least it is not *C. digitalis,* var. *macropoda.*

C. FLACCOSPERMA Dewey. To the record already published, from Norfolk County, add the following. SUSSEX COUNTY: border of wooded bottomland of Nottoway River, east of Stony Creek, no. 8156. SOUTHAMPTON COUNTY: wooded bottomland of Meherrin River, near Haley's Bridge, no 7772. GREENSVILLE COUNTY: rich deciduous woods by Metcalf Branch, east of Emporia, nos. 8157 (blue-green), 8158 (yellow-green). See p. 380.

C. CAROLINIANA Schwein. SOUTHAMPTON COUNTY: alluvial woods, bottomland of Meherrin River, Haley's Bridge, no. 8160, culms up to 1.65 m. high! See p. 377.

Our only station; the related *Carex complanata* Torr. & Hook. generally common.

C. BARRATTII Schwein. & Torr. To the only recorded Virginian station (near Waverly) add from SUSSEX COUNTY: open savannah-like swales in woods east of Stony Creek, no. 8140. GREENSVILLE COUNTY: wet cut-over sphagnous pine and oak woods, near Three Creek, north of Emporia, no. 8141.

Dominant, with *C. bullata, C. Buxbaumii* (new to Virginia), *Panicum scabriusculum* and *P. consanguineum* and other local species, over scores of acres of swale east of Stony Creek, probably one of its most extensive single areas of occurrence. See p. 381.

*C. BUXBAUMII Wahlenb. SUSSEX COUNTY; open savannah-like swales in woods east of Stony Creek, no. 8144, one of the largest extremes of the species. See note under *C. Barrattii.* See p. 381.

Not seen by Mackenzie (N. Am. Fl.) from the state.

C. STRICTA Lam. To the first Virginian station (in Princess Anne County), already reported, add one from PRINCE GEORGE COUNTY: swampy woods, bottomland of Powell's Creek, Garysville, no. 8142.

C. COLLINSII Nutt. To the first Virginian station (in Sussex County), already reported, add one from GREENSVILLE COUNTY: sphagnous wooded spring-heads east of Emporia, no. 8172. HENRICO

County: boggy thicket bordering Whiteoak Swamp, west of Elko Station, no. 9005. See p. 380.

C. Frankii Kunth. To the stations already reported (from Henrico and Sussex Counties) add the following. Prince George County: swampy woods, bottomland of Powell's Creek, Garysville, no. 8164. Surry County: swampy calcareous wooded gullies by James River, Claremont Wharf, no. 8165; seen in similar habitat at Eastover. Gloucester County: moist sandy border of pine woods, east of Gloucester, no. 8619. See p. 382.

C. squarrosa L. Local range extended southward through Greensville and Southampton Counties.

C. Grayii Carey. Local range extended eastward to Surry County: bottoms of calcareous wooded gullies by James River, Claremont Wharf, no. 8169, and seen in similar habitat at Eastover; and southward to Southampton County: alluvial wooded bottomland of Meherrin River, near Haley's Bridge, no. 8170; both the minor var. hispidula Gray. See p. 382.

C. bullata Schkuhr. To the first Virginian station (in Prince George County), already reported, add the following. Prince George County: inundated swampy thicket north of Templeton, no. 8173, culms up to 1 m. high. Sussex County: open savannah-like swales in woods east of Stony Creek, dominant, no. 8174 (see note under *C. Barrattii*); sphagnous depression, Wakefield, no. 8628. Greensville County: wooded swamp about 1 mile north of Skipper's no. 8629. Henrico County: sphagnous springy swales bordering Whiteoak Swamp, west of Elko Station, no. 9003. See p. 381.

Arisaema Dracontium (L.) Schott. Southampton County: alluvial wooded bottomland of Meherrin River, near Haley's Bridge, no. 8167.

Our only station on the Coastal Plain. See p. 377.

Symplocarpus foetidus (L.) Nutt. Surry County: along brook, rich calcareous wooded gullies at head of Sunken Meadow Creek, south of Claremont, local, no. 8179. See p. 382.

Lachnocaulon anceps (Walt.) Morong. To the recorded stations from other counties add one in Sussex County: pocket in pine woods bordering an open wooded swamp, 3½ to 4 miles northeast of Homeville, no. 8181; also one in Greensville County: forming extensive turf in sphagnous bog, about 1 mile northeast of Dahlia, no. 8630.

Xyris torta Sm., var. macropoda Fernald in Rhodora, xxxix. 395 (1937). To the original stations add from Dinwiddie County: sphagnous boggy margin of spring-fed pond, Century House, northeast of Burgess, no. 7371; sphagnous bog about 1 mile northeast of Burgess Station, no. 7372. Greensville County: sphagnous bog about 1 mile northwest of Dahlia, no. 8632. Brunswick County: argillaceous swale about 5 miles east-southeast of Edgerton, no. 8633. See p. 368.

X. AMBIGUA Beyrich. Local range extended westward to DINWIDDIE COUNTY: sphagnous bog about 1 mile north of Burgess, no. 7363; and GREENSVILLE COUNTY: wooded swamp of Mill Creek, north of Skipper's, no. 8634; and southeastward to NANSEMOND COUNTY: roadside ditch near St. Mary's Church, southwest of Whaleyville, no. 7368; roadside ditch bordering oak and pine woods, south of Suffolk, no. 7369.

*TRADESCANTIA ROSEA Vent., var. GRAMINEA (Small) Anders. & Woodson. SOUTHAMPTON COUNTY: dry sand, pine barrens about 7 miles south of Franklin, nos. 7374, 8182; dry sandy old clearing north of Smith's Ferry, no. 8639. See pp. 366, 380.

First from north of North Carolina.

*PONTEDERIA LANCEOLATA Nutt., forma BRASILIENSIS (Solms) Fernald in RHODORA, XXVII. 81 (1925). NANSEMOND COUNTY: margin of Somerton Creek, wooded bottomland, Factory Hill, nos. 8184, 8646. See p. 379.

First from north of Florida.

JUNCUS ELLIOTTII Chapm. Local range extended to SUSSEX COUNTY: open savannah-like swales in woods east of Stony Creek, no. 8187; and GREENSVILLE COUNTY: wet cut-over sphagnous pine and oak woods near Three Creek, north of Emporia, no. 8186; seen at other stations. See p. 381.

Probably overlooked because of its early development.

J. BRACHYCARPUS Engelm. To the single station reported for Virginia add the following. SUSSEX COUNTY: swale south of Stony Creek, no. 8189; peaty swale and open wooded swamp 3½ to 4 miles northeast of Homeville, nos. 8190, 8191. DINWIDDIE COUNTY: wet argillaceous depressions south of Petersburg, no. 8188; low clearing south of McKenney, no. 8651. GREENSVILLE COUNTY: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 8192. GLOUCESTER COUNTY: damp sandy border of woods east of Gloucester, no. 8652. See p. 378.

Apparently frequent or even common throughout the area. Heretofore considered one of the rarest species of the Atlantic States. Maturing very early (June) and over-ripe or shattered before the habitally similar midsummer- and autumn-fruiting *J. scirpoides* is conspicuous. Old and dried inflorescences are, late in the season, doubtless passed as last-year's inflorescences of the latter species.

LUZULA BULBOSA (Wood) Rydb. A most distinct species of woods and clearings in GREENSVILLE, SUSSEX and PRINCE GEORGE COUNTIES (many nos.). See p. 372.

L. ECHINATA (Small) Hermann. Rich woods, general eastward to NANSEMOND COUNTY (many nos.).

L. CAROLINAE Watson, var. **saltuensis** (Fernald), comb. nov. *L. saltuensis* Fernald in RHODORA, v. 195 (1903). *Juncoides pilosum* (L.) Coville, var. *saltuense* (Fernald) Farwell in Mich. Acad. Sci., Rep. xx. 170 (1918).

Luzula saltuensis, as it occurs in eastern Canada and the northernmost states is sufficiently different from the type of *L. carolinae* Watson in Proc. Am. Acad. xiv. 302 (1879). The latter was a single culm with the inflorescence overtopped by an erect frondose bract 1 dm. long. The longer branches of the inflorescence are forking, and the lower leaves are prolonged. The relative length of filament and anther differs in the northern series and the type of *L. carolinae* and it has seemed possible to hold the two series apart. In the Piedmont and Coastal Plain regions of Virginia, however, the plants have the forking rays of the inflorescence of *L. carolinae*, the anther-length proves variable and the bract at base of the inflorescence is, as in *L. saltuensis*, very short. Much study convinces me that the type of *L. carolinae* was an exceptional individual and that the large southern series, with some rays forking and with castaneous sepals, should be placed with it. Very evident transitions occur in western New York, southern Ontario and southern Michigan. This transitional series was named *Juncoides pilosum*, var. *michiganense* Farwell, l. c. (1918).

THE SOUTHERN VARIETY OF SMILACINA RACEMOSA (PLATES 512 and 513).—As it occurs in the northern portion of its range, from Quebec to British Columbia, thence southward to Nova Scotia, New England, most of New York and less characteristically southward, *Smilacina racemosa* (L.) Desf. has an ovoid to pyramidal panicle usually 1–1.5 dm. long and one-half to three-fourths as broad. From southern New England and northern New Jersey southward the species often has a subcylindric panicle usually less than 8 cm. long and only one-fourth to three-eighths as thick. Familiar with the plant of northeastern Canada and northern New England, I have been much impressed by these Virginian specimens in the field but have been unable to win a sympathetic response from my companion, Mr. Long. This apathy on his part was at once explained when I visited him at his home near Philadelphia while *Smilacina racemosa* was abundantly flowering in his woods, for the plant near Philadelphia is like that of most of eastern Virginia in having short and comparatively slender panicles. A comparison of the distinctive northern and the distinctive southern series brings out several strong tendencies which,

taken together, indicate a geographic segregation which should be given recognition. These are summarized below.

Northern Series. Stem up to 1 m. high; larger leaves of mature plants 1–2.5 dm. long, 3.5–9.5 cm. broad; panicle sessile or on a peduncle usually less than ½ its length, ovoid to pyramidal, 0.7–1.7 dm. long, 3–10 cm. in diameter, ⅜–¾ as broad as long, its longer branches 2–6 cm. long and with 8–24 flowers. Plate 512.

Southern Series. Stem rarely 7.5 dm. high; larger leaves of mature plants 0.85–1.7 dm. long, 3.5–6 cm. broad; peduncle ½–5/4 as long as the nearly cylindric panicle; the latter 4.5–8.5 (rarely –13) cm. long, 1.5–3 cm. in diameter, ¼–⅜ as broad as long, its longest branches 1–2.5 cm. long, 6–10-flowered. Plate 513.

Smilacina racemosa rests upon *Convallaria racemosa* L. Sp. Pl. i. 315 (1753), which in turn went back to *Polygonatum racemosum* Cornut (1635). The Linnean treatment was as follows:

5. CONVALLARIA foliis sessilibus, racemo terminali composito. *racemosa.*

Convallaria racemo composito. *Roy. lugdb.* 26.
Convallaria foliis alternis, racemo terminali.
Hort. cliff. 125. *Gron. virg.* 38.
Polygonatum racemosum. *Corn. canad.* 36, *t.* 37.
Polygonatum ramosum & racemosum spicatum. *Moris. hist.* 3. *p.* 537. *s.* 13. *t.* 4. *f.* 9.
Polygonatum racemosum americanum, ellebori albi foliis amplissimis. *Pluk. alm.* 301. *t.* 311. *f.* 2.
Habitat in Virginia, Canada. ♃ [L. Sp. Pl. i. 315, 316 (1753)].

Linnaeus gave a brief original diagnosis. I have not seen the specimen in his herbarium and the series of photographs of Linnean types sent me by Mr. Savage does not contain it. The application of the name, however, is fairly clear, although Linnaeus confused, as have all subsequent botanists, the two varieties. Ultimately *Smilacina racemosa* goes back to *Polygonatum racemosum* Cornut, Canad. Pl. 36 and *P. ramosum* Cornut, l. c. 37 (1635), where the Canadian plant was described under the former and illustrated under the latter name. The illustration, ramose presumably through the intervention of the artist, shows apparently the common northern plant unnaturally forking at the middle, one leafy branch terminated by an ovoid panicle in flower the other by a similar panicle in fruit. Although highly conventionalised and presumably unnatural, the plate shows relatively short peduncles and is better for the northern than for the southern series of specimens. Chronologically the next reference given by Linnaeus was to Morison's Plantarum Historiae (1715).

Morison's figure was an almost exact copy from Cornut and his description compared the inflorescence to that of the grape. Insofar as Morison had any clear conception of the plant it was that of Cornut. The next reference, chronologically, was to Hortus Cliffortianus (1737), Linnaeus's own work and, therefore, representing his own concept. Two sheets of perfectly preserved specimens are in the Hortus Cliffortianus herbarium at the British Museum. For photographs of them I am indebted to the kindness of Mr. Ramsbottom. They are both marked in the hand of Linnaeus *Convallaria racemosa* and should stand as the types. The summit of one of them is shown, × 1, as our PLATE 512. Its nearly or quite sessile inflorescence and the many-flowered branches place it immediately with the northern series of specimens, although the panicle is too slender for the majority of them. Gronovius (1739) cited Hortus Cliffortianus, but the Clayton specimen before him was undoubtedly the southern plant. Royen (1740) cited Hortus Cliffortianus, and other old references not mentioned by Linnaeus; and Plukenet (1749) illustrated the northern plant. There is, therefore, preponderant weight of argument (including Linnaeus's own specimens illustrating his Hortus Cliffortianus) for maintaining the larger-panicled and shorter-peduncled northern plant as true *Smilacina racemosa*.

So far as I can find there is no available name for the southern series, with somewhat lesser stature and long-peduncled, shorter and more slender panicle with fewer-flowered branches. *Smilacina ciliata* Desf. in Ann. Mus. d'Hist. Nat. Paris, ix. 53, t. 9 (1807) might have been based on it but the strongly bifurcate and trifurcate panicles shown are as atypical as was Cornut's *Polygonatum ramosum*. It was a cultivated plant, not easily matched in nature. I am, therefore, calling the southern series

SMILACINA RACEMOSA (L.) Desf., var. **cylindrata**, var. nov. (TAB. 513), a var. typica recedit caule humile rare 7.5 dm. alto; foliis maximis maturis 0.85–1.7 dm. longis 3.5–6 cm. latis; pedunculo elongato; panicula cylindrata vel subcylindrata 4.5–8.5 (rare–13) cm. longa, 1.5–3 cm. diametro, ramis longioribus 1–2.5 cm. longis 6–10-floris.—Georgia to Arizona, north to southern New Hampshire, central and western Massachusetts, southern New York, southern Ontario, Ohio, Indiana, Illinois, Kansas and Colorado. TYPE: dry mixed woods, Little Neck, Princess Anne County, Virginia, August 8 and 9, 1934, *Fernald & Long*, no. 3859. In PLATE 513, FIG. 1 is a flowering summit, × 1, from Henrico County, Virginia; FIG. 2, the summit of the type, × 1.

The coarser northern plant is

Var. **typica.** *Convallaria racemosa* L. Sp. Pl. i. 315 (1753), excluding citation of Gronovius in part. *Smilacina racemosa* (L.) Desf. in Ann. Mus. d'Hist. Nat. Paris. ix. 51 (1807). *S. racemosa*, forma *oliosa* Victorin in Contrib. Lab. Bot. Univ. Montréal, no. 14: 15, fig. 1 (1929).—Quebec to British Columbia, south to Nova Scotia, New England, Long Island, Pennsylvania, upland and rich valleys of Virginia and Tennessee, Michigan, Illinois, Missouri, Arizona and Oregon. PLATE 512.

That the ranges of the two overlap is obvious, and in these bordering areas the transitions are also obvious. North and south of the transition belt the two extremes are striking.

The only material of var. TYPICA I have seen from the Coastal Plain of Virginia is from SURRY COUNTY: rich wooded gullies along James River, below Sunken Meadow Beach, *Fernald & Long*, no. 8200, there associated with many upland and northern types.

SMILAX PULVERULENTA Michx. SURRY COUNTY: rich calcareous wooded gullies by James River, Claremont Wharf, no. 8203. See p. 382.

A species chiefly of the upland areas southward.

*NARCISSUS INCOMPARABILIS Mill. SOUTHAMPTON COUNTY: "soft shoulder" of road, Ivor, no. 7799, an escape from cultivation.

* ×N. BARRII Hort. SOUTHAMPTON COUNTY: with the last, no. 7800.

HYPOXIS LEPTOCARPA Engelm. & Gray. To the two stations already recorded from the county add the following, also in SOUTHAMPTON COUNTY: alluvial wooded bottomland of Meherrin River, near Haley's Bridge, no. 8213. NANSEMOND COUNTY: wooded bottomland of Somerton Creek, about 2 miles east of Factory Hill, no. 8674, leaves up to 7 dm. long and 1.4 cm. broad!

*SISYRINCHIUM CAPILLARE Bicknell. SUSSEX COUNTY: open pinelands about 4 miles northwest of Waverly, no. 8214. See p. 381.

First from north of North Carolina.

S. MUCRONATUM Michx. SURRY COUNTY: beech woods, slopes of gully 1½ miles north of Surry, no. 8216.

Our first Coastal Plain station in Virginia.

ORCHIS SPECTABILIS L. SURRY COUNTY: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8219; rich calcareous wooded gullies by James River, Claremont Wharf, nos. 7804, 8218; seen in similar habitat at Eastover. See p. 375.

Our first Coastal Plain stations in Virginia.

CLEISTES DIVARICATA (L.) Ames. SUSSEX COUNTY: sphagnous siliceous boggy depression just northwest of Wakefield, no. 7392, only

a few plants, which will soon be wiped out by broadening of the automobile road. See p. 367.

Spiranthes ovalis Lindl. To the single station (in Henrico County), already recorded, add Sussex County: alluvial woods, upper terrace of Nottoway River, southwest of Burt, no. 7394. Southampton County: alluvial wooded bottomland of Meherrin River, near Haley's Bridge. no. 8221. See pp. 366, 377.

Ponthieva racemosa (Walt.) Mohr. To the few recorded stations add one from Surry County: beech woods, slopes of gully 1½ miles north of Surry, no. 8222. See p. 383.

Aplectrum hyemale (Muhl.) Torr. Surry County: rich wooded slope at head of Sunken Meadow Creek, south of Claremont, no. 7805; seen also on calcareous wooded slopes at Claremont Wharf. See p. 375.

Populus deltoides Marsh. Banks and gullies along the James at least to Surry County. See p. 383.

*Myrica pusilla Raf. Dry or moist sandy pinelands, scattered to frequent in Southampton, Sussex and southern Isle of Wight Counties. Our specimens are from 4 miles northwest of Waverly, *F. & L.*, no. 6992; south of Zuni, no. 6994; about 7 miles south of Franklin, nos. 6987, 6989, 6995, 7404 and 7405; Cypress Bridge, no. 6993.

Myrica pusilla is the dwarf, usually freely stoloniferous and colonial shrub ranging from 2 to 10 dm. high, or very exceptionally, and then probably through crossing with *M. cerifera*, slightly higher, further separated from *M. cerifera* by its obtuse oblanceolate to narrowly obovate leaves only 1.5–4 cm. long and by its fruits 3–4 mm. in diameter (the leaves of *M. cerifera* acute and mostly 4–9 cm. long, the fruits 2–3 mm. in diameter). It was Michaux's *M. cerifera*, γ. *pumila*, "fruticulosa: foliis minoribus, magis cuneatis . . . in aridis, a Carolina ad Floridam," raised to specific rank by Small in 1896 as *M. pumila* (Michx.) Small, with no further elucidation of its characters than "It seems strange that this so-called variety of *Myrica cerifera* has never before been given specific rank." Fifty-eight years earlier, however, Rafinesque in his "Alsographia Americana, Or an American Grove of New or revised Trees and Shrubs of Genera Myrica," etc. had described 7 species of *Myrica*. His *M. pusilla* was, for him, an unusually well described species:

20. *Myrica pusilla* Raf. cerif. pumila Bartr? caule pumilo piloso angulato, fol. sessilib. obov. and cuneatis, apice ineq. serratis acutis, supra rugosis, subtus ferrugineis glabris, margine et nervo ciliatis—minute shrub, only 3 to 6 inches high, in Alabama and Florida, leaves very un-

Photo. H. G. Fernald.

SMILACINA RACEMOSA, var. CYLINDRATA: FIG. 1, flowering tip, × 1; FIG. 2, fruit of TYPE, × 1.

Photo. H. G. Fernald.

COMPTONIA PEREGRINA: FIG. 7, young staminate inflorescence, × 1; FIG. 8, fruiting aments, × 1; FIG. 9, young branchlet, × 10; FIG. 10, lower surface of leaf, × 10.

Var. ASPLENIFOLIA: FIGS. 1 and 2, staminate and pistillate branchlets of *Myrti brabanticae affinis americana, foliorum laciniis asplenii modo divisis* of Plukenet, basis of *Myrica asplenifolia* L., copied from PLUKENET, × 1; FIGS. 3 and 4, staminate and pistillate branchlets, × 1, from Virginia; FIG. 5, young branchlet, × 10; FIG. 6, lower surface of leaf, × 10.

equal and less than one inch long, Bartram calls them sinuate and yellow pulverulent.

There can be no question that Rafinesque had the dwarf, stoloniferous species of the southern coastal plain. The bibliography of the species is as follows.

Myrica pusilla Raf. Alsogr. Am. 10 (1838). *M. cerifera*, γ. *pumila* Michx. Fl. Bor.-Am. ii. 228 (1803); Chevalier, Mon. Myric. 180 [264] (1901). *M. pumila* (Michx.) Small in Bull. Torr. Bot. Cl. xxiii. 126 (1896). *Cerothamnus pumilus* (Michx.) Small, Shrubs of Fla. 8, 133 (1913).

Myrica heterophylla Raf.

In Rhodora, xxxvii. 423, 424 (1935), I pointed out that the coarse evergreen shrub or small tree with oblong to narrowly obovate leaves lustrous above but more or less pubescent beneath and with blackish branches permanently pubescent is *M. Curtissi* Chevalier, var. *media* (Michx.) Chevalier, Mon. Myric. 186 [270] (1901), based upon *M. cerifera*, β. *media* Michx. Fl. Bor.-Am. ii. 228 (1803), in part. This coarse shrub or small tree is common at the inner margin of the Coastal Plain in southeastern Virginia, and Mr. Long assures me that it is characteristic also of the inner Coastal Plain in southern New Jersey. It extends southward to Florida. In Florida and rarely northward to southeastern Virginia a variety with glabrous (instead of pubescent) branchlets occurs. This is typical *M. Curtissi* Chevalier, l. c. 185 [269].

Unfortunately, Chevalier did not have access to Rafinesque's Alsographia Americana, with its very full treatment of *Myrica*, for he cites it always with doubt or upon the authority of others. There can be no question that Rafinesque's *M. heterophylla* was *M. Curtissi*, var. *media*. It is probable, likewise, that Rafinesque's *M. sessilifolia* and its var. *latifolia* were phases of the same shrub. I quote Rafinesque's accounts.

17. *Myrica heterophyl[l]a* Raf. arborea, ramis nigrescens pubesc. fol. ellipt. and obov. subpet. integris vel apice grosse serratis acutis, utrinque glabris sed nervo medio supra and subtus pubescens—Carolina to Florida, probably one of the sp. blended in *M. cerifera*. name unmeaning since all bear wax: leaves larger broader and thinner than in last, sometimes opposite, or obliqual, or really elliptical. Seen alive in gardens.

18. *Myrica sessilifolia* Raf. fruticosa, ramis cinereis puberis, fol. sessilib. cuneatis acutis, apice parce serratis, glabris, nervo medio subt. puberis, margine revolutis ciliolatis, drupis subracem. globosis parvis granulatis cerulescens—on the Sea Shores from New Jersey to Florida,

shrub 4 to 8 feet high, leaves smaller uncial, berries small, probably the *M. cerifera pumila* of Mx. not Bartram, which is 20.

19. Var. *latif.* diff. fol. nonnulis obovatis integris, vel obl. cuneatis acutis vix serratis—with the last, probably the var. media of Mx.

Myrica Curtissi, var. *media* is characteristic of the *inner* Coastal Plain in New Jersey and Virginia and southward, not on the "Sea Shores," but from New Jersey to southeastern Virginia the northern deciduous-leaved *M. pensylvanica* Loisel. chiefly follows the coastal sands and dunes but occasionally pushes inland. Although it is probable that Rafinesque's *M. sessilifolia* and especially its var. *latifolia* were in part based upon the former species, it is better to retain for it the first of his names, *M. heterophylla*, for the blackish pubescent branches, the elliptic or obovate leaves pubescent beneath, and the range, Carolina to Florida, all clearly indicate the coarse shrub or small tree which Chevalier called *M. Curtissi*, var. *media*. The bibliography follows.

Myrica heterophylla Raf. Alsog. Am. 9 (1838). *M. cerifera*, β *media* Michx. Fl. Bor.-Am. ii. 228 (1803) in part. *? M. sessilifolia* and var. *latifolia* Raf. l. c. 10 (1838). *M. Curtissi*, var. *media* (Michx.) Chevalier, Mon. Myric. 186 [270] (1901).

Var. **Curtissi** (Chevalier), comb. nov. *M. Curtissi* Chevalier, Mon. Myric. 185 [269] (1901). To the station in Norfolk County previously noted by me add Southampton County: moist peaty and sandy depressions in pine barrens, about 7 miles south of Franklin, *F. & L.*, no. 7400. Isle of Wight County: sandy pine barrens south of Zuni, *F. & L.*, no. 6988.

In my earlier discussion I took up for the northern deciduous-leaved species which, southward, is strictly maritime, the name *M. pensilvanica* Loisel. Professor Rehder calls my attention to the fact that Loiseleur also spelled the specific name *pensylvanica*. Since the latter form was adopted by Chevalier in his monograph, this more usual spelling should prevail.

Comptonia peregrina (L.) Coulter, var. **asplenifolia** (L.), comb. nov. *Myrica asplenifolia* L. Sp. Pl. ii. 1024 (1753). Southampton County: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, no. 8229. See Plate 514, figs. 1–6.

As noted on p. 379, *Comptonia* consists of two well defined varieties.

(1) A northern wide-ranging shrub with more or less pilose new branchlets and leaves; fruiting aments 1.5–2.5 cm. in diameter; nuts 4–5 mm. long; staminate aments subapproximate or approximate. Figs. 7–10.

(2) A smaller shrub of Coastal Plain pinelands or pine barrens, with new branchlets minutely puberulent only; smaller leaves more sparsely

short-puberulent or glabrous (except for midrib); fruiting aments only 0.8–1.5 cm. in diameter; nuts 3–4 mm. long; staminate aments more scattered. FIGS. 1–6.

Linnaeus, in preparing Species Plantarum (1753), had both shrubs. The wide-ranging and more northern and inland shrub (our no. 1) was his

> 2. LIQUIDAMBAR foliis oblongis sinuatis. *peregrina*
> *Habitat in* Canada. [Sp. Pl. 999].

The Coastal Plain shrub (our no. 2) was chiefly his

> *asplenifolia.* 3. MYRICA foliis oblongis alternatim sinuatis. *Hort. cliff.* 456. *Gron. virg.* 142. *Cold. noveb.* 224.
> Gale mariana, asplenii folio. *Pet. mus.* 773.
> Myrti brabanticae affinis americana, foliorum laciniis asplenii modo divisis. *Pluk. alm.* 250. *t.* 100. *f.* 6.7.
> *Habitat in* America septentrionali. ♄
> [Sp. Pl. 1024].

Colden's plant of New York was, of course, our no. 1. Otherwise, the plants which Linnaeus had before him (those of Hortus Cliffortianus, Gronovius and Plukenet) were chiefly our no. 2. Linnaeus's own work, Hortus Cliffortianus, merely refers to the treatment by Plukenet. Plukenet, who erroneously thought the shrub came from Brasil, although he had much material from Maryland and Virginia, gave two very clear figures (here reproduced as our figs. 1 and 2) showing the characteristic Coastal Plain shrub with no pilosity indicated, the very small fruiting ament and the remote young staminate aments. Our FIGS. 3 and 4 show parallel portions from our Virginian collection (no. 8229), while FIG. 5 indicates the puberulence, × 10, of the young branchlet, FIG. 6 the lower surface of the leaf of no. 8229, × 10. Gronovius merely referred to Hortus Cliffortianus, but cited two collections by Clayton, one (from Middlesex County on the Coastal Plain) doubtless our no. 2, the other (from shaded bluffs of North Anna River, in the interior) possibly our no. 1. In view, however, of the convergence of the more important Linnean references upon the Plukenet figures it is right to consider *Myrica asplenifolia* as based chiefly upon them and the specimens (at one time accessible to Linnaeus) upon which they were based.

As to the correct name to take up, usage through a century or more has favored *Myrica asplenifolia* (1753), while *Liquidambar peregrina*, published in the same work (1753), has been more often treated as a synonym. Linnaeus, however, settled the question when he united

the two in 1759, in his Systema Naturae, ed. 10, ii. 1273 (1759), treating them as *Liquidambar*

peregrina. 2. L. fol. oblongis sinuatis. Myrica asplenifolia. *Spec. pl.*

The two being first united under the specific name *peregrina* we are forced, unhappily, to take that as the correct specific name.

Briefly, the bibliography of the two is as follows,

Comptonia peregrina (L.) Coulter in Mem. Torr. Bot. Cl. v. 127 (1894); Chevalier, Mém. Soc. Sci. Nat. & Math. Cherbourg, xxxii. 196—repr. Monogr. Myric. 109 (1901). *Liquidambar peregrina* L. Sp. Pl. ii. 999 (1753), Syst. Nat. ed. 10, ii. 1273 (1759) in part. *C. Ceterach* Mirbel in Duham. Arb. ed. nov. ii. t. 11 (1804) in part. *Myrica Comptonia* (Banks) A. DC. Prodr. xvi^2. 151 (1864), largely. *M. peregrina* (L.) Ktze. Rev. Gen. Pl. 638 (1891). *C. peregrina,* var. *tomentosa* Chevalier, l. c. 196 [112] (1901)—Quebec to Manitoba, south to Virginia, West Virginia, Ohio, northwestern Indiana, Wisconsin and Minnesota, and in the upland to northern Georgia and Tennessee. Figs. 7–10.

Var. asplenifolia (L.) Fernald. *Myrica asplenifolia* L. Sp. Pl. ii. 1024 (1753), as to plant of Hortus Cliffortianus, Plukenet, etc., not of Colden. The names cited above as in part belonging to *C. peregrina* are in part, also, synonyms of var. *asplenifolia.*—Dry sandy pinelands and barrens of the Coastal Plain, Virginia to Long Island. Figs. 1–6.

Juglans cinerea L. Banks and gullies along the James at least to Surry County. See p. 375.

Ostrya virginiana (Mill.) Koch. The typical northern and inland tree, with glabrous branchlets, extending down the James at least to Surry County. See p. 382.

*Fagus grandifolia Ehrh., var. caroliniana (Loud.) Fern. & Rehder, forma mollis Fern. & Rehder. Southampton County: wooded slope, bordering river-swamp, Cypress Bridge, no. 6997.

Quercus montana L. (*Q. Prinus* of authors, not L.) Surry County: rich woods and thickets back of sand-beach of the James, below Sunken Meadow Beach, no. 7238; seen at Eastover. See p. 382.

Isolated from the Piedmont area.

Q. laevis Walt. To the long-known station in Isle of Wight County add for Southampton County: dry sand, pine barrens about 7 miles south of Franklin, no. 7415. See p. 366.

Q. cinerea Michx. Southampton County: dry sand, pine barrens about 7 miles south of Franklin, nos. 7418, 7419, 8242. See p. 366.

Previously known in the state only at Cape Henry.

Q. borealis Michx., var. maxima (Marsh.) Ashe. Surry County:

rich alluvial woods and thickets back of the sand-beach of the James, Claremont Wharf, no. 8241; seen at Eastover. See p. 382.

A species of the interior.

ULMUS FULVA Michx. Follows down the James and near-by gullies to SURRY COUNTY. See p. 375.

LAPORTEA CANADENSIS (L.) Gaud. Follows down the James and near-by gullies at least to SURRY COUNTY. See p. 382.

THE GEOGRAPHIC VARIETIES OF POLYGONUM SETACEUM (PLATE 515). In eastern Virginia *Polygonum setaceum* occurs in three strikingly different phases: 1st, a plant of swamps of the outer Coastal Plain (in Princess Anne County thence up the valley of the James at least to Prince George County), with the leaves copiously long-strigose above and usually beneath (FIGS. 1 and 2); 2nd, a plant at the border of the Piedmont (Dinwiddie County and locally to Nansemond), with the leaves short-strigose above and short-strigose to glabrous beneath (FIGS. 3 and 4); 3rd, the plant of the rich alluvial bottoms of the inner Coastal Plain (Sussex, Southampton, Isle of Wight, Nansemond and James City Counties), with leaves nearly or quite glabrous on both surfaces. Obviously, these three plants do not all accord with Small's key-character: "leaf-blades copiously loosely strigose"; and study of the series in the Gray Herbarium indicates that the three are well defined geographic varieties. The first occurs from Florida to Texas, northward to Cape Henry, Virginia and up the lower James and, apparently isolated, in southern New Jersey; the second is more northern and inland, from Cape Cod to north-central New York, south to the outer Piedmont of Virginia; and it is in northern Indiana. The third is as yet known only from southeastern Virginia and in Oklahoma.

I am defining them as follows:

Leaf-surfaces (especially when young) strigose above.
  Strigosity of upper leaf-surface of mixed short and long hairs, the latter 0.8–1.5 mm. long; hairs of lower surface similar, usually abundant; ochreae copiously strigose-villous.....Var. *typicum.*
  Strigosity of upper leaf-surface wholly or chiefly of stiffer hairs only 0.2–0.5 (rarely –0.8) mm. long; lower surface similarly strigose or more often glabrous; ochreae more remotely strigose.....Var. *interjectum.*
Leaf-surfaces glabrous or essentially so; ochreae only sparsely strigose.....Var. *tonsum.*

P. SETACEUM Baldw., var. **typicum.** *P. setaceum* Baldw. ex Ell. Sk. i. 455 (1817).—Swamps, shores and low woods, Texas to Florida,

north to Princess Anne, Surry and Prince George Counties, Virginia; Cape May, New Jersey. Figs. 1 and 2.

*Var. **interjectum**, var. nov. (tab. 515, fig. 3 et 4), ochreis subremote strigosis; follis supra scabro-strigosis, strigis 0.2–0.5 (–0.8) mm. longis, subtus breviter strigosis vel glabratis.—Southeastern Massachusetts to Oswego County, New York, south to Dinwiddie County, Virginia; northwestern Indiana. Massachusetts: moist thicket along Doane Creek, Harwich, August 13, 1918, *Fernald & Long*, no. 16,749 (type in Gray Herb.); September 11, 1919, *Fernald* in Pl. Exsicc. Gray. no. 356; moist sandy overflow from cultivated cranberry bog, Doane Creek, Harwich, August 30, 1918, *Fernald & Long*, no. 16,750; brookside near mouth of Red River, Harwich, August 8, 1919, *Fernald & Long*, no. 18,402. Rhode Island: edge of bushy swamp, Westerly, August 25, 1924, *Weatherby*, no. 5361. New York: wet shore of Sweezy Pond, Southampton, July 26, 1920, *St. John*, no. 2703; along brooks in swampy woods and thickets overlying Silurian (Medina) sandstones, Mud Pond, Oswego, August 23, 1922, *Fernald, Wiegand & Eames*, no. 14,269. Virginia: border of swampy woods northwest of Carson, Dinwiddie County, September 14, 1937, *Fernald & Long*, no. 7429; low clearing, south of McKenney, Dinwiddie County, July 18, 1938, *Fernald & Long*, no. 8703; swale by tidal stream northeast of Suffolk, Nansemond County, July 21, 1938, *Fernald & Long*, no. 8701. Indiana: under *Cephalanthus*, edge of a *Chamaedaphne* bog near Rolling Prairie, La Porte County, July 31, 1920, *D. C. Peattie*.

*Var. **tonsum**, var. nov. (tab. 515, fig. 5 et 6), ochreis sparse strigosis; foliis utrinque glabris.—Virginia: open situation beside stream, 1½ miles west of Williamsburg, October 7, 1920, *Grimes*, no. 3170; alluvial woods, Coppahaunk Swamp, about 3 miles southeast of Waverly, September 10, 1937, *Fernald & Long*, no. 7428; swampy woods by Blackwater River, south of Zuni, August 24, 1936, *Fernald & Long*, no. 6589; siliceous and argillaceous alluvium bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, July 23, 1936, *Fernald & Long*, no. 6198 (type in Gray Herb.; isotype in Herb. Phil. Acad.); margin of Somerton Creek, Factory Hill, July 20, 1938, *Fernald & Long*, no. 8700. Oklahoma: "common," Sapulpa, September 25, 1894, *Bush*, no. 509 (young foliage sparsely strigose).

Paronychia canadensis (L.) Wood. See Rhodora, xxxviii. 418 (1936). Sussex County: rich wooded slope, 4 miles south of Stony Creek, no. 8254.

*Spergula arvensis L., var. sativa (Boenn.) Reichenb. Sussex County: weed in roadside fill ("soft shoulder"), recently seeded, about 4 miles south of Jarratt, no. 7817. See p. 373.

Stellaria pubera Michx. Extending into the Coastal Plain in

PRINCE GEORGE COUNTY: sandy, loamy wooded slopes along Powell's Creek, Garysville, no. 7818. See p. 375.

*CERASTIUM TETRANDRUM Curtis. SUSSEX COUNTY: weed in sandy field, Wakefield, no. 7819. See p. 373.

A European species not heretofore recognized in this country.

HOLOSTEUM UMBELLATUM L. GREENSVILLE COUNTY: cultivated field 1 mile south of Emporia, no. 7820. See pp. 372, 373.

Very local in eastern Virginia.

SILENE CAROLINIANA Walt. SURRY COUNTY: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7822. DINWIDDIE COUNTY: plentiful in sandy woods by Steere's Millpond, east of Burgess, *Meade Lewis* (our no. 8257).

S. VIRGINICA L. GREENSVILLE COUNTY: rich deciduous woods by Metcalf Branch, east of Emporia, no. 8258. See p. 380.

Our only station on the Coastal Plain of Virginia; the plants are of the form with petals only shallowly notched or emarginate, instead of deeply cleft. Further consideration may show this difference to have phytogeographic significance.

S. STELLATA (L.) Ait. f. SOUTHAMPTON COUNTY: border of sandy woods about 3 miles east of Drewryville, no. 7434. SURRY COUNTY: rich wooded slope by James River, Eastover, no. 8708. HENRICO COUNTY: border of woods, Elko Station, no. 8709.

Our only Coastal Plain stations, although Grimes had two additional ones on the Peninsula of Virginia.

*CLAYTONIA VIRGINICA L., forma **micropetala**, f. nov. (TAB. 516, FIG. 1), forma petalis anguste oblongis 3–5 mm. longis; staminibus valde exsertis.—VIRGINIA: a small colony, in the midst of abundant typical *C. virginica*, loamy wooded slope along tributary of Chippoak Creek, east of Cabin Point, Surry County, April 5, 1938, *Fernald & Long*, no. 7823 (TYPE in Gray Herb.; ISOTYPE in Herb. Phil. Acad.).

Typical and abundant *Claytonia virginica* (FIG. 2) has the large and broad petals conspicuously longer than the sepals and definitely exceeding the stamens. Forma *micropetala*, occurring in the midst of the ordinary plant, is a striking sport.

*NYMPHAEA ALBA (L.) Presl, forma ROSEA Hartm. f. DINWIDDIE COUNTY: thoroughly naturalized (dominating) in peaty spring-fed pond, Century House, northeast of Burgess, no. 7436. See p. 368.

BRASENIA SCHREBERI Gmel. DINWIDDIE COUNTY: peaty spring-fed pond, Century House, northeast of Burgess, no. 7437. PRINCE GEORGE COUNTY: Miner's Pond, about 3 miles south of Petersburg, no. 8262.

RANUNCULUS AMBIGENS Wats. To the single station (in Chester-

field County) already recorded add one in Southampton County: alluvial wooded bottomland of Meherrin River, near Haley's Bridge, no. 8263.

Ranunculus abortivus and its Eastern American Allies (Plates 517–519). *Ranunculus abortivus* L., as treated by Gray, was a very inclusive species. By the removal of *R. alleghenicnsis* Britton (pl. 517, fig. 1), *R. micranthus* Nutt. (pl. 517, figs. 2 and 3) and *R. Harveyi* (Gray) Britton (pl. 517, fig 4) it becomes greatly simplified but it is still a highly variable type in which I recognize 4 geographic varieties. In order to clarify the species I append a key to the small group to which it belongs, in the area covered by Gray's Manual. Since some of these have not been adequately illustrated I am including photographs to show at least the diagnostic characters; and am giving a statement of range of each.

a. Achenes 1.5–2 mm. long, with firm subulate beak.
Stems weak, flexuous, villous, 1–4-flowered; sepals spreading, 3–5 mm. long; petals 4–6 mm. long; alpine species....*R. Allenii.*
Stems firm, erect, glabrous, corymbose-cymose, many-flowered; sepals reflexed, 2.5–3.5 mm. long; petals 1.5–2.3 mm. long; Alleghenian species.....*R. alleghenicnsis.*
a. Achenes 1.1–1.5 mm. long, the beak obsolete or soft and minute.
Roots slender and fibrous; simple radical leaves 1–9.5 cm. broad, with 9–43 marginal teeth; sepals 2.5–5 mm. long, sessile; fruiting heads 3–4.5 mm. thick; achenes lustrous; receptacle hairy.....*R. abortivus.*
Roots fusiform-thickened; simple radical leaves 0.8–2.5 cm. broad, with 5–13 marginal teeth; sepals 2–3.5 mm. long, abruptly contracted to a claw; fruiting heads 2.5–3.3 mm. thick; achenes dull; receptacle glabrous.
Uncleft basal leaves cuneate, rounded or barely subcordate at base, often mixed with divided ones; petals 2–3.5 mm. long, about equaling sepals.....*R. micranthus.*
Uncleft basal leaves cordate or subcordate, rarely mixed with divided ones; petals 4–8 mm. long, much exceeding sepals.....*R. Harveyi.*

R. Allenii Robinson in Rhodora, vii. 220 (1905).—Wet gravel and flood-plains of alpine brooks, northern Labrador and Shickshock Mts. Quebec. Pl. 517, figs. 5 and 6.

R. alleghenicnsis Britton in Bull. Torr. Bot. Cl. xxii. 224 (1895). *R. abortivus*, form, Hook. Fl. Bor.-Am. i. 15 (1829).—Rich woods and rocky calcareous or basic slopes, rarely in meadows, rather local, Massachusetts to Ohio, south to North Carolina and Tennessee. Pl. 517, fig. 1.

R. abortivus L. See below.

R. micranthus Nutt. in Torr. & Gray, Fl. N. Am. i. 18 (1838). *R. abortivus*, var. *micranthus* (Nutt.) Gray, Man. ed. 2: 9 (1856).—

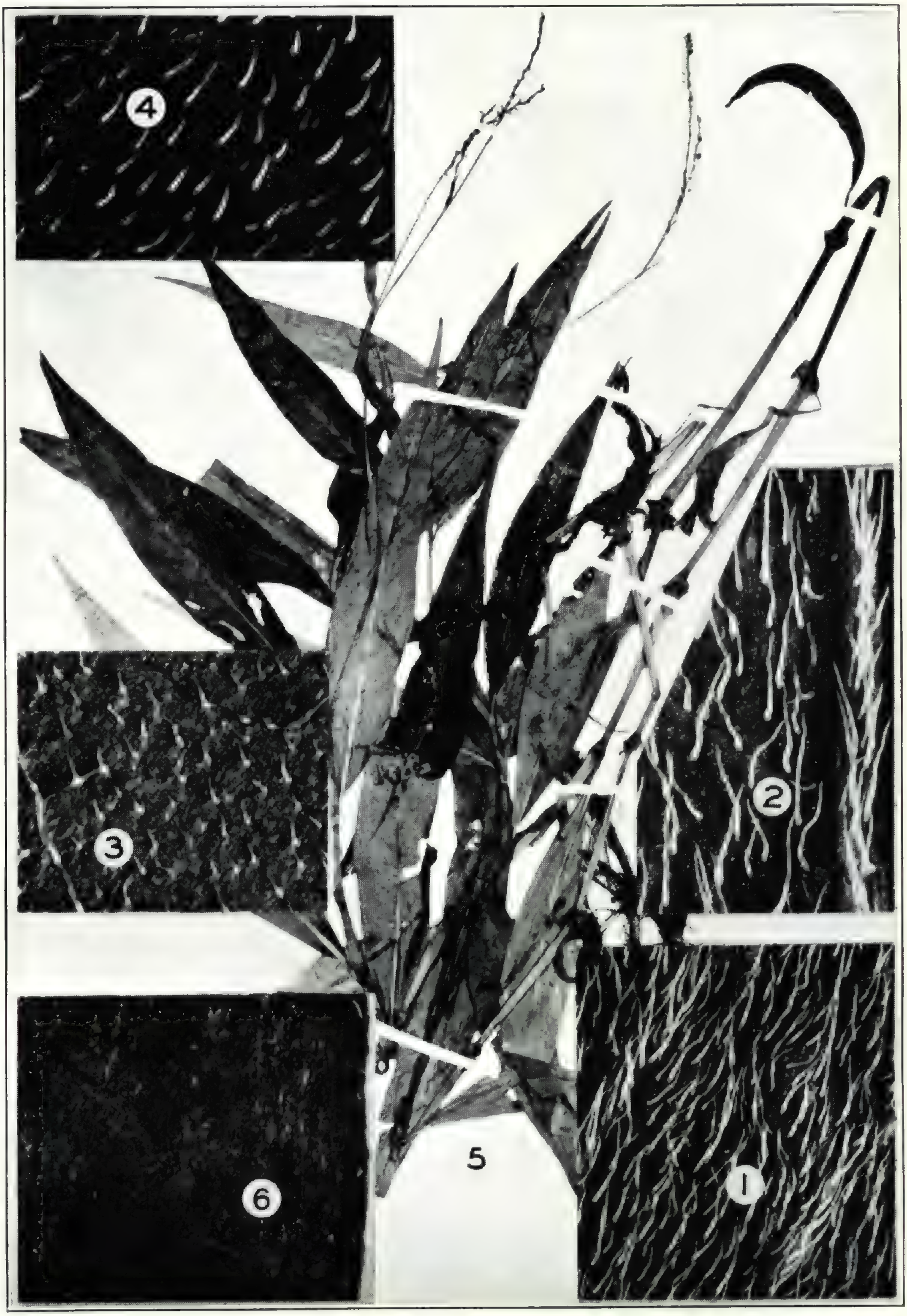


Photo. H. G. Fernald.

POLYGONUM SETACEUM, var. TYPICUM: FIGS. 1, lower, and 2, upper surface of leaf, × 10.

Var. INTERJECTUM: FIGS. 3, lower, and 4, upper surface of leaf, × 10, from TYPE.

Var. TONSUM: FIG. 5, TYPE, × $^{2}/_{5}$; FIG. 6, upper surface of leaf, × 10, from TYPE.

Photo. H. G. Fernald.

CLAYTONIA VIRGINICA: FIG. 2, young inflorescence, × 1.
Forma MICROPETALA: FIG. 1, TYPE, × 1.

Thin soil, chiefly on rocky or dryish slopes in slight shade, Massachusetts to Illinois, south to Georgia, Alabama and Arkansas. PL. 517, FIGS. 2 and 3.

R. HARVEYI (Gray) Britton in Mem. Torr. Bot. Cl. v. 159 (1894). *R. abortivus*, var. *Harveyi* Gray in Proc. Am. Acad. xxi. 372 (1886).—Ledges, bluffs and ravines, western Alabama, Missouri and Arkansas. PL. 517, FIG. 4.

To *Ranunculus Harveyi* I refer plants from a rich shady ravine near Warrior River about 8 miles above Tuscaloosa, Alabama, April 14, 1932, *R. M. Harper*, and April 19, 1934, *Harper*, no. 3181.

Ranunculus abortivus ordinarily has all the upper cauline leaves and frequently the lower cauline ones deeply divided into narrow segments or leaflets. It was, therefore, a great surprise to Mr. Long and me to find (see p. 374) in early April, 1938, that a plant of the bottomlands of the Nottoway River in Sussex County, Virginia, the only known region for *Geum canadense*, var. *brevipes* Fernald in RHODORA, xxxix. 410, t. 479, figs. 1–3 (1937), had the cauline leaves quite simple throughout. This was the common plant along the main Nottoway and also along its tributary, Three Creek, in Southampton County. I can find no material to match it, but some from Newfoundland and Gaspé suggests an approach to it. The suggestion, however, is superficial only, for the peduncles and upper internodes of the northern plants are minutely pilose, those of the southern plant quite glabrous. With these points in mind I have studied all the material of *R. abortivus* in the Gray Herbarium and the herbarium of the New England Botanical Club and present the following synopsis of its varieties.

a. Basal uncleft leaves merely cordate at base, with open sinuses . . . . *b*.
  b. Peduncles, upper internodes and leaf-surfaces glabrous or essentially so.
    Uppermost and often all cauline leaves divided to base into narrow segments; radical leaves simple or some of them divided . . . . . *R. abortivus*, var. *typicus*.
    All cauline as well as radical leaves simple and undivided. Var. *indivisus*.
  b. Young peduncles (at least toward base), upper internodes and often the surfaces of youngest cauline leaves minutely pilose . . . . . Var. *acrolasius*.
a. Basal uncleft leaves orbicular, with a narrow or nearly closed sinus . . . . . Var. *eucyclus*.

R. ABORTIVUS L., var. **typicus**. *R. abortivus* L. Sp. Pl. i. 551 (1753). *R. nitidus* Walt. Fl. Carol. 159 (1788).—Low woods, thickets, clearings and damp slopes, northern Florida to Oklahoma, north to southern Maine, south-central New Hampshire, Vermont, New York, Ohio, Michigan, Wisconsin, Minnesota and southern Saskatchewan.

There is scarcely a doubt that the type of *Ranunculus abortivus* is the common plant of Atlantic United States with cleft cauline leaves and glabrous stems and peduncles. Linnaeus described it from "Virginia, Canada"; but most of his references go back to the Virginian plant. I am, therefore, typifying the species, should it prove that there was a mixture, by "Ranunculus foliis radicalibus reniformibus crenatis petiolatis; caulinis paucis digitatis sessilibus. *Gronov. virg.* 166," cited by Linnaeus and the basis of the Virginian references. All material from Virginia and adjacent states is quite glabrous.

*Var. **indivisus**, var. nov. (TAB. 518), planta glabra; foliis omnibus indivisis, basilaribus reniformibus crenatis; foliis caulinis imis petiolatis late flabellatis vel breviter ovatis, superioribus flabellatis vel obovatis vel oblongis crenatis vel leviter lobatis.—Bottomland woods of the Nottoway River system, Sussex and Southampton Counties, VIRGINIA: Nottoway River, southwest of Burt, April 3, 1938, *Fernald & Long*, no. 7827; Nottoway River, northwest of Lumberton, April 3, 1938, *Fernald & Long*, no. 7828; Three Creek, Drewryville, April 9, 1938, *Fernald & Long*, no. 7829 (TYPE in Gray Herb., ISOTYPE in Herb. Phil. Acad.); Nottoway River at Cypress Bridge, June 16, 1938, *Fernald & Long*, no. 8264.

The fresh plants of var. *indivisus* were a dark lustrous green, strongly contrasting with the few plants present of var. *typicus*, which appeared duller and of a yellowish green.

Var. **acrolasius**, var. nov. (TAB. 519, FIG. 1 et 2), planta habitu var. *typico* simillima; pedunculis juvenilibus internodiis superioribusque minute pilosis; foliis superioribus juvenilibus plerumque pilosis.—Southern Labrador to British Columbia, south through Canada and northern New England, locally to Massachusetts, northern Rhode Island, northern Connecticut, western New York, northern Michigan, Black Hills of South Dakota and Wyoming, and along the Rocky Mountains to Colorado. The following, from a large series, are typical. LABRADOR: Forteau, *Fernald & Wiegand*, no. 3418; Blanc Sablon, *Fernald & Wiegand*, no. 3417. NEWFOUNDLAND: Bear Cove, Straits of Belle Isle, *Wiegand & Pease*, no. 28,261; Deep Gulch, Doctor Hill, *Fernald, Long & Fogg*, no. 1699; Ingornachoix Bay, *Fernald & Wiegand*, no. 3419; St. Anthony, *E. C. Abbe*, no. 339; Grand Falls, *Fernald & Wiegand*, no. 5435. QUEBEC: Pointe-aux-Esquimaux, Seign. de Mingan, *St. John*, no. 90,462; Mont Saint-Pierre, *Rousseau*, no. 31,181; Mt. Collins, *Fernald et al.*, no. 25,757; Bic, *Fernald & Collins*, no. 1039; Longueuil, *Victorin*, no. 4286; Sand Pit Island, James Bay, *Potter*, no. 367; Rupert House, James Bay, *Potter*, no. 366. MAGDALEN ISLANDS: Brion Island, *St. John*, no. 1883. PRINCE EDWARD ISLAND: Alberton, *Fernald & St. John*, no. 7486;

Bear River, *Fernald & St. John*, no. 11,059. NEW BRUNSWICK: St. Jacques, Madawaska, *Pease*, no. 2421. NOVA SCOTIA: Truro, June 15, 1883, *J. Macoun*. MAINE: Masardis, *Fernald*, no. 2206; Island Falls, *Fernald*, nos. 2207, 2218; Orono, *Fernald* nos. 2208, 2209, 2211; Dover, *Geo. B. Fernald*, no. 19; Pittston, Somerset Co., *St. John & Nichols*, no. 2294; Perry, *Fernald*, no. 1777; Southwest Harbor, June 6, 1888, *Rand;* Matinicus, *C. A. E. Long*, no. 71; Vassalboro, May 5, 1902, *Chamberlain;* North Berwick, *Parlin*, no. 1242. NEW HAMPSHIRE: Pittsburg, *A. H. Moore*, no. 3706; Stratford Hollow, *Pease*, no. 13,535; Headwall of Tuckerman's Ravine, July, 1858, *E. S. Hoar*, July 21, 1909, *Pease*, no. 12,047; Shelburne, May 17, 1910, *Deane* (TYPE in Herb. N. E. Bot. Cl.); West Lebanon, May 9, 1900, *Kennedy;* Piermont, May 26, 1933, *Knowlton;* Hampton Falls, May 21, 1914, *Batchelder;* Peterborough, May 7, 1927, *Batchelder;* Jaffrey, *Rand & Robinson*, no. 93. VERMONT: Island Pond, June 12, 1932, *Weatherby, Upham & Rossbach;* Mt. Mansfield, July 2, 1897, *Williams;* Morristown, May 30, 1923, *Knowlton;* Ripton, June 10, 1902, *Brainerd;* Whitingham, *St. John & Hill*, no. 12,059. MASSACHUSETTS (all specimens seen): Danvers, June, 1896, *J. H. Sears;* Cascade Rocks, Melrose, *Pease*, no. 1881; Lexington, May 6, 1882, *Deane;* Belmont, May 1, 1906, *Batchelder;* Gill, May 11, 1912, *St. John & Weatherby;* Monroe, *Hill & St. John* (*St. John*, no. 1697); Greenfield, May 11, 1912 *Batchelder, Kennedy & Williams;* Lanesboro, May 22, 1916, *Churchill.* RHODE ISLAND (all seen): Lincoln, May 15, 1904, *Williams*. CONNECTICUT: (all seen): Tariffville, May 17, 1913, *Winslow & Hill*. NEW YORK (all seen): "W. New York," *Gray*. ONTARIO: Kingston, May 11, 1901, *Fowler;* Bear Island, Temagami Forest Reserve, *W. R. Watson*, no. 1655; Tobermory, Bruce Co., *Krotkov*, no. 7445; Pic River, Algoma District, *Loring;* Jack Fish, Thunder Bay Distr., *Pease & Bean*, no. 23,338. MICHIGAN: Keweenaw County, *Farwell*, no. 147. MANITOBA: Mile 214, Hudson Bay Ry., July 8, 1917, *J. H. Emerton;* Lake Winnipeg Valley, 1857, *Bourgeau*. SOUTH DAKOTA: Bald Hills, Black Hills Nat. Forest, *Murdoch*, no. 4067. SASKATCHEWAN: locality not stated, 1857–8, *Bourgeau*. ALBERTA: vicinity of Rosedale, *Moodie*, no. 972. MONTANA: Bozeman, May 24, 1901, *E. J. Moore*. WYOMING: Black Hills, *Nelson*, no. 9463; Sundance Creek, *Nelson*, no. 2115. COLORADO: "Rocky Mountains, Lat. 39°–41°," *Hall & Harbour;* Dudley's Ranch, *E. L. Greene;* La Platte Cañon, *E. L. Hughes*, no. 21. BRITISH COLUMBIA: Lower Frazer River, 1859, *Lyall;* International Boundary between Kettle and Columbia Rivers, *J. M. Macoun*, no. 63,484.

Presumably on account of the pubescence of the young parts *Ranunculus abortivus*, var. *acrolasius* was identified by Gray with the quite distinct *R. micranthus*, and collections from others are so identified. At the southern parts of its range it clearly passes into var. *typicus*, several specimens being quite transitional. The geographic

separation of the glabrous (except for occasional ciliolate upper leaves) var. *typicus* and var. *acrolasius* is clearly brought out by the facts that all material seen by me from south of northern Connecticut, western New York and northern Michigan is definitely var. *typicus;* while all material from Newfoundland, and essentially all from Canada and the Black Hills and Rocky Mountain region is var. *acrolasius*, although var. *typicus* doubtless reaches southern Ontario. From Maine I have before me 4 collections of var. *typicus* (from Lincoln, Cumberland and York Counties—all in the south) but 30 sheets of var. *acrolasius*, from all parts of the state; from Massachusetts 97 sheets of var. *typicus* but only the 8 cited of var *acrolasius;* while from Rhode Island and Connecticut only one specimen from each state has been seen of var. *acrolasius*.

Var. EUCYCLUS Fernald in RHODORA, i. 52 (1899).—Newfoundland to western New York and western Connecticut. PL. 519, FIG. 3. Since no type was designated when var. *eucyclus* was published, I am here designating as TYPE the collection which originally called attention to this extreme: low woods, Gilead, Maine, August 10, 1897, *Kate Furbish*, in Gray Herb. The characteristic radical leaf of the TYPE is shown, × 1, in PLATE 519, FIG. 3.

*R. SARDOUS Crantz. (*R. parvulus* L.) SOUTHAMPTON COUNTY: roadside ditch in alluvial wooded bottomland of Meherrin River, near Haley's Bridge, no. 8265.

A European species now becoming naturalized.

MYOSURUS MINIMUS L. PRINCESS ANNE COUNTY: field, Virginia Beach, April 18, 1909, *E. B. Bartram*. SURRY COUNTY: shaded dooryard, Surry, no. 7837. SOUTHAMPTON COUNTY: argillaceous and siliceous cotton-field north of Sebrell, no. 7836. See pp. 372, 373.

The doubt implied in Gray's Manual, ed. 7, by the wording, "reported from e. Va.," is removed; but the plant is there certainly an introduction, presumably from Europe.

THALICTRUM REVOLUTUM DC. SURRY COUNTY: calcareous, fossiliferous bushy slope, near head of Sunken Meadow Creek, south of Claremont, no. 8266; seen in similar habitat at Eastover. See p. 382.

Our only Coastal Plain stations.

ANEMONELLA THALICTROIDES (L.) Spach. Extending eastward to PRINCE GEORGE COUNTY: sandy, loamy wooded slopes along Powell's Creek, Garysville, no. 7838. See p. 375.

HEPATICA AMERICANA (DC.) Ker. Eastward on slopes of gullies near the James at least to SURRY COUNTY: wooded slopes along

Photo. H. G. Fernald.

RANUNCULUS ALLEGHENIENSIS: FIG. 1, fruiting head, × 4.
R. MICRANTHUS: FIG. 2, plant, × 1; FIG. 3, flower, × 4.
R. HARVEYI: FIG. 4, portion of plant, × 1.
R. ALLENII: FIG. 5, portion of flowering plant, × 1; FIG. 6, fruiting head, × 4.

Photo. H. G. Fernald.

RANUNCULUS ABORTIVUS, var. INDIVISUS: FIG. 1, TYPE, × 2/5; FIG. 2, fruiting head, × 4.

tributary of Chippoak Creek, east of Cabin Point, no. 7839; seen at Eastover. See p. 375.

CLEMATIS OCHROLEUCA Ait. To the single Coastal Plain station (in Sussex County) already reported add the following. DINWIDDIE COUNTY: dry woods by Steere's Millpond, east of Burgess, *Meade Lewis* (our no. 8270), also 8271. GREENSVILLE COUNTY: rich woods near Metcalf Branch, east of Emporia, no. 7840. See p. 374.

CALTHA PALUSTRIS L. SURRY COUNTY: by brook in drained cypress swamp, Claremont Wharf, no. 7841. See p. 382.

CIMICIFUGA RACEMOSA (L.) Nutt. SURRY COUNTY: rich calcareous wooded gullies by James River, Claremont Wharf, no. 8274; seen in similar habitat at Eastover. See pp. 375, 383.

MENISPERMUM CANADENSE L. SURRY COUNTY: rich alluvial woods and thicket back of sand-beach of James River, Claremont Wharf, nos. 7845, 8276; also seen at Eastover. See pp. 375, 382.

PERSEA PALUSTRIS (Raf.) Sarg. Our most inland station is in NANSEMOND COUNTY: swampy pine woods near Crismond, no. 7440.

SANGUINARIA CANADENSIS L., var. ROTUNDIFOLIA (Greene) Fedde. Frequent in rich woods eastward to SURRY, ISLE OF WIGHT and SOUTHAMPTON COUNTIES.

DRABA BRACHYCARPA Nutt. Closely approaching the Coastal Plain in BRUNSWICK COUNTY: mossy pasture by Meherrin River, northeast of Brodnax, no. 7045; and in MECKLENBURG COUNTY: old pasture and roadside, north bank of Roanoke River, near Goode's Ferry, no. 7044. See p. 364.

*TEESDALIA NUDICAULIS (L.) R. Br. SUSSEX COUNTY: roadside fill ("soft shoulder"), recently seeded, about 4 miles south of Jarratt, no. 7840. See p. 373.

European species, now becoming frequent, from southeastern Massachusetts to North Carolina (verbal report by the botanists of North Carolina State College).

*RAPHANUS RAPHANISTRUM L., forma SULPHUREUS (Babey) Hayek. SUSSEX COUNTY: with the last, no. 7852.

Petals clear yellow, without the dark stripes of typical *R. Raphanistrum.*

DENTARIA LACINIATA Muhl. Eastward in rich woods at least to SURRY and GREENSVILLE COUNTIES. See p. 375.

*DENTARIA LACINIATA Muhl., var. **coalescens,** var. nov. (TAB. 520), foliis simplicibus laminis lanceolatis oblanceolatis vel obovatis digitato- vel pinnatifido-incisis.—VIRGINIA: rich woods, Great Neck, Princess Anne County, May 5, 1935, *Fernald & Griscom,* no. 4413 (TYPE in Gray Herb.).

Throughout its broad inland range *Dentaria laciniata* has 3 definite leaflets; these may be simply sharp-toothed or lacerate or the lateral

leaflets may have 2–4 variously toothed segments. So far as our experience has shown it does not occur on the outer Coastal Plain of Virginia; and Grimes did not find it on the Peninsula of Virginia. In the Piedmont section of the state it is found, and it occurs locally in calcareous gullies of streams entering the James as far eastward as Claremont in Surry County. The area where var. *coalescens* abounds is between the open Atlantic and Lynnhaven Bay, at least 50 miles southeast of Claremont; and its associates are a remarkable series of isolated Piedmont, Appalachian Upland or inland types: *Uniola sessiliflora* Poir., *Smilax herbacea* var. *lasioneuron* (Hook.) DC., *Menispermum canadense* L. (also at Claremont), *Desmodium paucifiorum* Michx., *Erigeron pulchellus* Michx. (also at Claremont), *Silphium atropurpureum* Retz., *Heliopsis helianthoides* var. *solidaginoides* (L.) Fernald, and *Senecio aureus* L. (southeast along tributaries of the James at least to Claremont). Isolated by at least 50 miles from typical *Dentaria laciniata*, the peculiar plant of Great Neck has apparently been able to diverge along a new line in its merely cleft or lobed leaves. When we originally found the plant in some abundance Mr. Griscom and I were greatly puzzled by it; and the material remained without identification for a full year. Then, since it has the hirsute rachis of the inflorescence and the characteristic siliques and nearly the tubers of *D. laciniata*, I temporarily called it that.

Cardamine bulbosa (Schreb.) BSP. Local on the Coastal Plain. Sussex County: springhead in bottomland-woods, Warwick Swamp, northwest of Waverly, no. 7856. Southampton County: wooded bottomland of Meherrin River, near Haley's Bridge, no. 7857.

Arabis virginica (L.) Poir. A rather local weed, maturing early (March and April) and perhaps overlooked. Greensville County: cultivated field 1 mile south of Emporia, no. 7054. Southampton County: argillaceous and siliceous cotton-field north of Sebrell, no. 7859. Sussex County: argillaceous and siliceous cotton-field south of Littleton, no. 7858. See pp. 364, 372, 373.

A. laevigata (Muhl.) Poir. Surry County: rich wooded gullies along James River, below Sunken Meadow Beach, no. 8278; seen in similar habitat at Eastover and at Claremont Wharf. Prince George County: rich woods, Coggins Point, no. 9055. See p. 382.

In 1903, in describing *Arabis georgiana*, Harper referred to it as "the first *Arabis* reported from the coastal plain of the eastern United States with the exception of *A. virginica*" (Harper in Torreya, iii. 88). Hopkins has noted three other species which overlap into the Coastal

Plain: *A. lyrata*, *A. canadensis* and *A. Drummondi*. *A. laevigata*, locally very abundant, adds another to the list.

SARRACENIA PURPUREA L., var. VENOSA (Raf.) Fern. Additional stations in SUSSEX, SOUTHAMPTON and GREENSVILLE COUNTIES.

S. FLAVA L. Additional stations in DINWIDDIE and GREENSVILLE COUNTIES. See pp. 367, 368.

DROSERA CAPILLARIS Poir. To the recorded stations in Dinwiddie, Prince George and Sussex Counties add the following. SOUTHAMPTON COUNTY: moist peaty and sandy depressions in pine barrens, about 7 miles south of Franklin, no. 7444. GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, nos. 8719, 9018; peaty openings bordering wooded swamp north of Skipper's, no. 9057. NANSEMOND COUNTY: moist sandy field north of Factory Hill, no. 8279.

D. BREVIFOLIA Pursh. To the recorded stations in Nansemond and Elizabeth City Counties add one in GREENSVILLE COUNTY: wet cut-over sphagnous pine and oak woods near Three Creek, north of Emporia, no. 8280. See p. 378.

SEDUM NEVII Gray. Approaching the Coastal Plain in MECKLENBURG COUNTY: rocky wooded slope, south bank of Roanoke River, Goode's Ferry, no. 7056. See p. 364.

S. TERNATUM Michx. Extending locally into the Coastal Plain. PRINCE GEORGE COUNTY: sandy alluvium, bottomland of Powell's Creek, Garysville, no. 7861. SURRY COUNTY: rich wooded gullies along James River, below Sunken Meadow Beach, no. 8281; and seen in similar habitat at Eastover. See pp. 375, 382.

SAXIFRAGA VIRGINIENSIS Michx. Reaching the inner margin of the Coastal Plain in GREENSVILLE COUNTY: alluvial woods by Three Creek, 2 miles north of Emporia, no. 7057. See p. 375.

HEUCHERA AMERICANA L. Extending locally eastward to SURRY COUNTY: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7862; rich wooded gullies along James River, below Sunken Meadow Beach, no. 8282; seen also at Eastover; and SUSSEX COUNTY: rich woods, Moore's Mill, no. 7446. See p. 375.

HYDRANGEA ARBORESCENS L. Extending eastward to SURRY COUNTY: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7863; rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8284; rich wooded gullies along James River, below Sunken Meadow Beach, no. 8285; seen also at Eastover; and GREENSVILLE COUNTY: rich woods by Metcalf Branch, east of Emporia, *F. G. & L.*, no. 6601 (distributed as from Caney Branch). See pp. 374, 375.

PHYSOCARPUS OPULIFOLIUS (L.) Maxim. SURRY COUNTY: rich alluvial woods and thickets back of sand-beach of James River, below Sunken Meadow Beach, no. 8289. See p. 382.

*Pyrus serotina Rehder. Surry County: naturalized in rich woods, west of Bacon's Castle, no. 7867.

An Asiatic species introduced into cultivation in the middle of the last century.

(*To be continued*)

An unexpected Addition to the Flora of Western Massachusetts.—During some recent census work on the plants occurring at Pleasant Valley Bird and Wild Flower Sanctuary in Lenox, Massachusetts, a puzzling specimen of plantain was tentatively identified as *Plantago virginica* L. in spite of the fact that the species was not supposed to occur in this region. Now, however, through the courtesy of the Gray Herbarium at Harvard, this unexpected occurrence has received professional verification, and proves to be the westernmost New England station for this form, which otherwise (in New England) has apparently been found only in coastal sections. Altogether perhaps a dozen specimens of the plantain have been found growing on the shore of an artificial pond which has now practically reverted to the wild condition, a location that has repeatedly proved to be a fruitful source of botanical finds otherwise absent or scarce on the Sanctuary. Though attempts to explain the origin of this stray plantain are purely speculative, the possibility that it was introduced in the materials used to build up the shores of the pond is at least suggestive.—George J. Wallace, Pleasant Valley Bird and Wild Flower Sanctuary, Lenox, Massachusetts.

Volume 40, no. 476, including pages 235–260 and plates 497–507, was issued 6 September, 1938.

Photo. H. G. Fernald.

RANUNCULUS ABORTIVUS, var. ACROLASIUS: FIG. 1, TYPE, × ⅖; FIG. 2, flower, × 4. Var. EUCYCLUS: basal leaf of TYPE, × 1.

Photo. H. G. Fernald.

DENTARIA LACINIATA, var. COALESCENS: TYPE, × 1.

NOV 15 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. November, 1938. No. 479.

CONTENTS:

Notes from Herbarium of University of Oklahoma—I.
Milton Hopkins 425

Noteworthy Plants of Southeastern Virginia (continued).
M. L. Fernald 434

Miscellaneous Notes on United States Plants. *Robert F. Martin*. 459

Another New Hampshire Station for Rhododendron maximum.
R. J. Eaton..... 461

Notes on some Maine Plants. *Anne E. Perkins*..... 462

Nomenclature at the next International Congress (Notice).
J. A. Nannfeldt..... 464

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

1/ pl.521-530

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **November, 1938.** **No. 479.**

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF OKLAHOMA—I[1]

MILTON HOPKINS

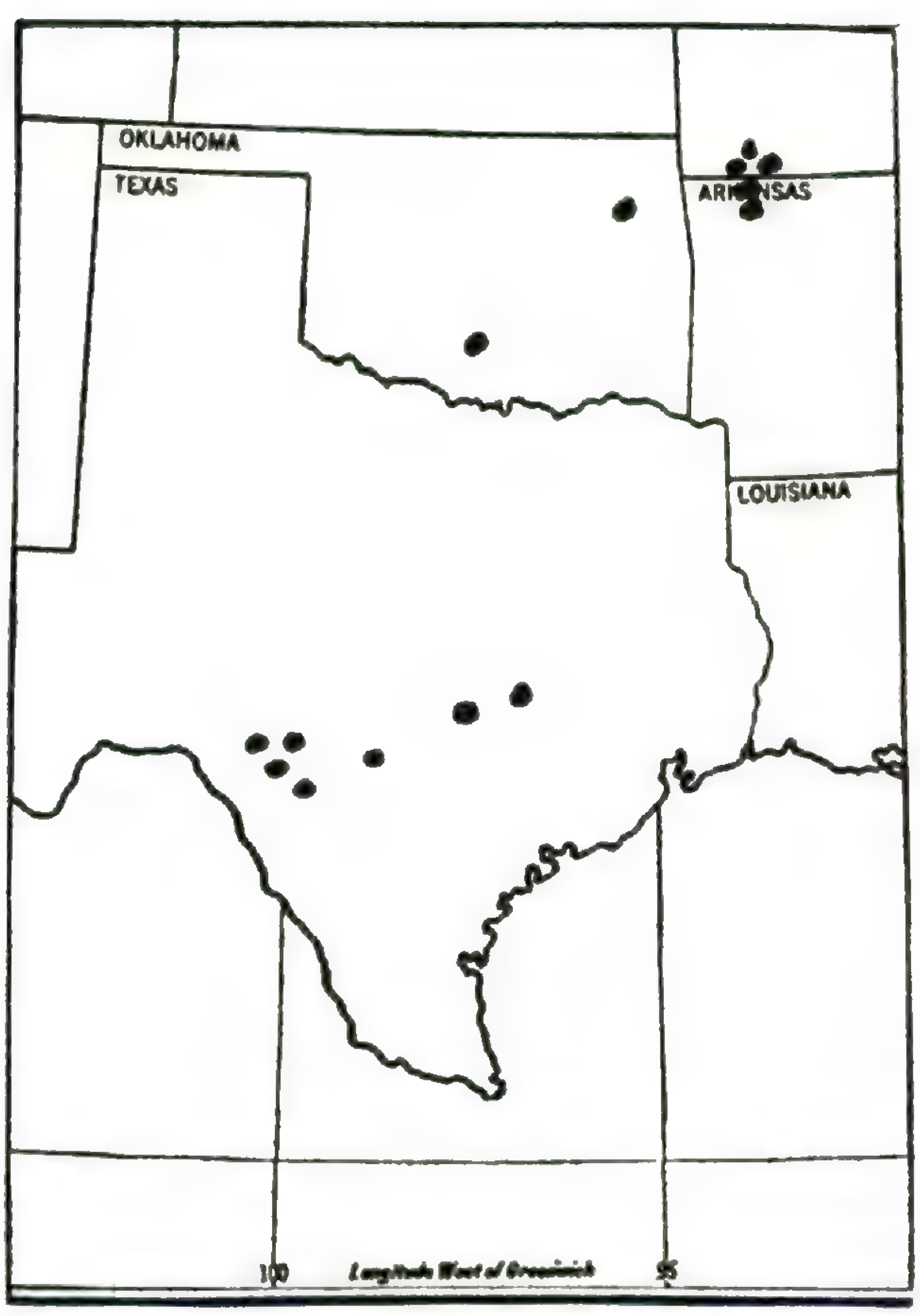
THE GEOGRAPHIC RANGE OF JUNIPERUS MEXICANA.—The Arbuckle Mountains of south-central Oklahoma have long been of interest to students of geology and botany because of their limestone formations and because of the unusual plants which occur there. In reality they form merely a xeric limestone plateau raised above the floor of the prairies around them.[2] As Palmer[3] has so lucidly pointed out, their

[1] Contribution from the Botanical Laboratory, University of Oklahoma, no. 50. The field-work of collecting the plants mentioned in this paper was made possible by a grant given to me by the AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE through the OKLAHOMA ACADEMY OF SCIENCE.

[2] Palmer, E. J. "Notes on some Plants of Oklahoma" Journ. Arnold Arboretum XV. 132 (1934). Regarding the Arbuckle Mountains he says: "If the Wichita Mountains are such only by courtesy, it might be thought to put a strong tax upon the proprieties or at least upon scientific accuracy to designate the Arbuckle region as a mountainous one. The low rounded hills are underlaid largely by a hard Paleozoic limestone, through which has been thrust a mass of porphyritic intrusive rocks that now come to the surface over a small area. The limestone is exposed on many of the hill tops and slopes and as bluffs at some places along the Washita River which traverses the region. The soil is therefore decidedly alkaline over much of the area, although it is sandy and more acid in parts of the river valley as well as where the igneous rocks are exposed. The general aspect of the country with the outcrops of hard pure limestone eroded by occasional torrential rains that interrupt the usually dry climate, give it a strong resemblance to parts of the Edwards Plateau in central Texas, an impression which a study of the flora strongly confirms."

[3] l. c. Mr. Palmer also wrote me, in November 1937, as follows: "I found that most of the plants peculiar to the limestone hills of the Arbuckles were extensions of ranges from the Edwards Plateau of Texas, and that their incursion across the Red River and so far north is doubtless to be accounted for by the facts of the remarkable similarity in soil and physical conditions of the two regions. The only Juniper found in the Edwards Plateau—or at least in the typical parts of it—is *J. mexicana*, and it occurred to me that that was the species that should be found in the Arbuckles along with its consociates from further south. The case is really much stronger as to the similarity of the floras than I stated in my published paper, as a number of other Edwards Plateau plants have since turned up that I did not mention."

flora is as closely related to that of the Edwards Plateau of southwestern Texas as it is to any region within the political boundaries of Oklahoma, and consequently the occurrence there of the Mexican cedar is hardly to be considered unique, although its real identity in this state has long been confused. With Palmer's notes in my mind and with the discovery of "*J. Ashei*" on limestone bluffs in northeastern Oklahoma,[1] I endeavored to ascertain the exact range of *J. mexicana* within the United States, and to attempt to explain the reason for its distribution as far north as the Ozark area. "Juniper trips" were made to the Arbuckle Mountains and to the Wichita Mountains,[2] which are a range of hills in southwestern Oklahoma composed entirely of granitic formations, and herbarium specimens of cedars were borrowed from all of the larger botanical institutions. Insofar as I have been able to learn, the plant has a range as indicated in MAP 1. Common on the Edwards Plateau of Texas, it is found locally through central and northern Texas, occurs on the Ar-



MAP 1. Range of JUNIPERUS MEXICANA (north of Mexico).

[1] By Dr. Dwight M. Moore, of the University of Arkansas, who found the plant in Mayes County. It was described by Buchholz (Bot. Gaz. xc. 331. 1930) from northwestern Arkansas and southwestern Missouri, but Palmer and Steyermark (Ann. Mo. Bot. Gard. xxii. 454. 1935) have shown it to be synonymous with *J. mexicana*.

[2] The students at the University of Oklahoma became so "juniper conscious" that whenever field trips were scheduled in any department of the Biological Sciences the botanical collecting equipment was taxed by ardent young zoologists and ecologists eager to obtain cedars. Dr. A. O. Weese and his students in bio-ecology contributed materially to the one hundred or more specimens of *Juniperus* which found their way into the herbarium from various parts of the state.

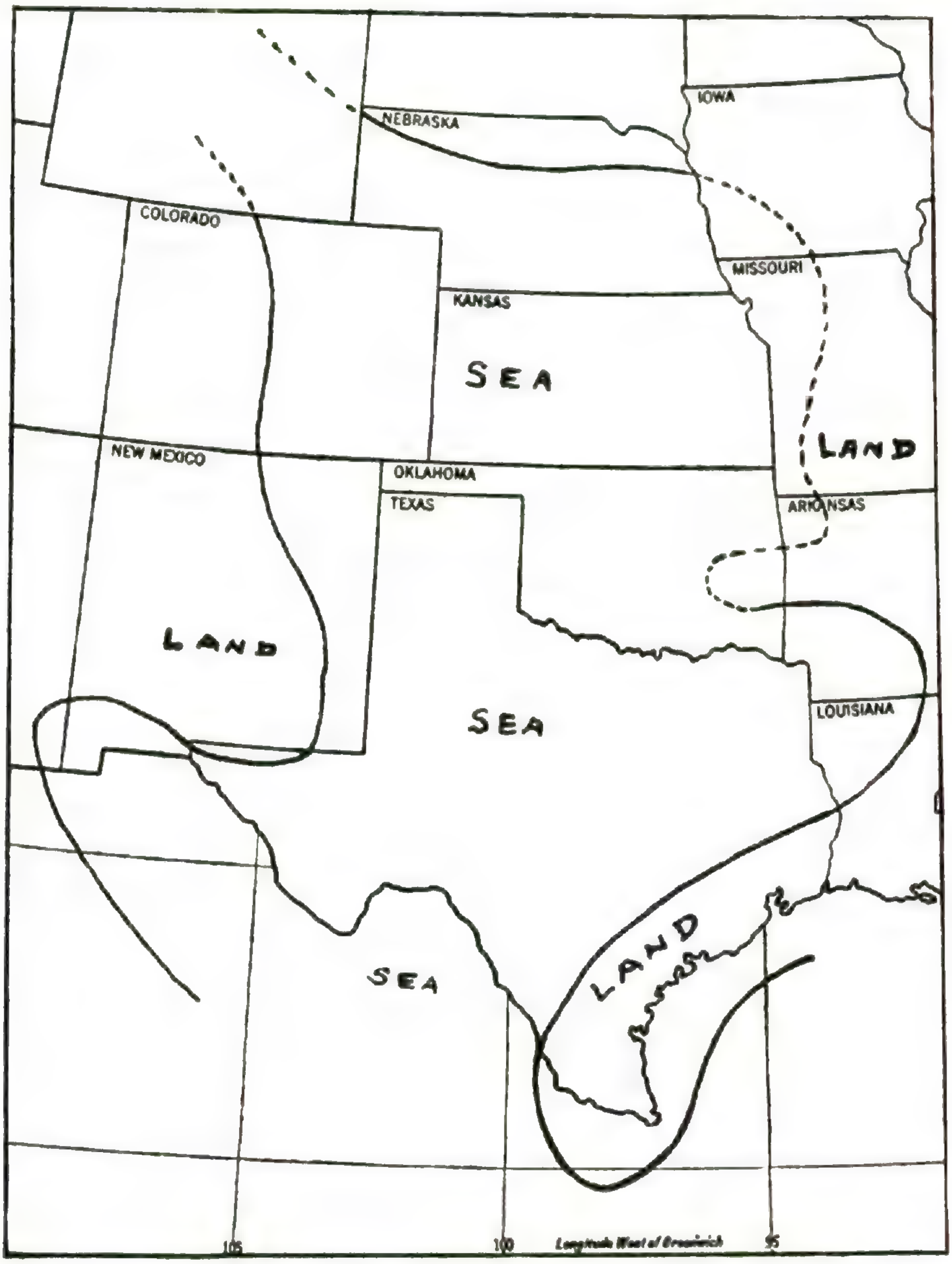
buckle limestones of Oklahoma where it is dominant, and then appears on limestone outcrops in northeastern Oklahoma and adjacent Arkansas and Missouri. In Oklahoma it covers the Arbuckles completely and is easily recognized in the field as distinct from *J. virginiana*[1] which is the only other cedar in the central part of the state. As one approaches the plateau from the prairies, the common red cedar is everywhere, but as soon as the slight ascent to Turner's Falls (in the "heart" of the Arbuckles) is made, *J. mexicana* is the only conifer to be found, and shares the region with such woody plants as *Rhus trilobata, Quercus marilandica* and *Q. stellata.* Its complete absence in the Wichitas, where *J. virginiana* abounds, is easily explained by the fact that there is no limestone in that area, except for a slight outcrop of the Arbuckle limestone several miles north, although no record of *J. mexicana* from that outcrop has come to my notice.

The Mexican cedar is definitely a calciphile, as every collector has observed. It appeared to me, therefore, that there might have been a former connection, now buried, between the Ozark, the Arbuckle and Texas stations, but geological evidence quickly convinced me that such a situation could hardly have been the case. A connection such as this could only have existed in the Cambrian, and no one can argue that coniferous plants occupied the earth at that time! Nor could I give credence to a theory that birds brought the seeds (as one of my students naïvely, but quite sincerely, pointed out) from the Edwards Plateau to the Arbuckles and the northeastern part of the state. Clearly, it seemed, there must have been an ancient seabed over the area, and with this hypothesis in mind, I conferred with my geological colleagues. They added information as follows. There was a Lower Cretaceous sea which extended from Mexico and Texas northward through Oklahoma, Kansas and Nebraska, and probably into northeastern Oklahoma and adjoining parts of Arkansas and Missouri (Map 2).[2] This sea invaded the region under discussion in the latter part of Lower Cretaceous time but the area was definitely not available to plants until the recession of the waters, and some erosion, took place in the Eocene. If we assume that *J. mexicana* came into existence at that time, and inhabited the limestone soils of that seabed we

[1] *J. mexicana* differs from *J. virginiana* in the field in its larger fruits, greyish twigs, and almost invariably forked stem. It is usually a more dwarfed plant with a broader crown. Frequently it is decidedly bushy in aspect rather than tree-like.

[2] This map has been constructed by Dr. F. A. Melton, of the Department of Geology in the University of Oklahoma, to whom I am deeply indebted for his kind cooperation.

would have a continuous range for the plant through Mexico, Texas, Oklahoma and the southern Ozark region. In later Tertiary this seabed was eroded back so that at present it is found as the calcareous



Map 2. Extent of Lower Cretaceous Sea. Solid lines after *Schuchert;* dotted lines after *Melton.*

outcrops with which we are familiar—the Mexican Plateau, the Edwards Plateau and the limestone outcrops of north and central Texas and southern Oklahoma. These outcrops in an earlier stage of erosion, while more widespread than at present, made the connection

with the older limestones of the Arbuckle Mountains and with the Ozark region. Naturally, when this ancient sea-bottom was eroded the juniper could not exist on the sandy, clay or acid soils and hence was eradicated, excepting at those localities where the calcareous outcrops, of Cretaceous origin, remained. Such stations are today the localities for the plant. This theory is in perfect accordance with geological evidence and appears to explain, quite simply, the present range of the cedar. Much additional research needs to be done, especially to discover whether angiospermous plants follow the same distribution. Palmer informs us that many of the Arbuckle plants are found on the Edwards Plateau but he fails to cite a reason for this northern extension of the Texas flora. It is highly probable that when complete information is available we shall be able to postulate that many identical species of flowering plants occur in southwestern Texas, in the Arbuckles of Oklahoma and probably also in the Ozark area of Oklahoma, Arkansas and Missouri.

SORGHASTRUM ELLIOTTII Nash. MCCURTAIN COUNTY: pine barrens and dry sterile woods, 6 miles southeast of Broken Bow, *Hopkins & Cross*, no. 2421.

In the course of a botanical survey of southeastern Oklahoma, a region of pine barrens and cypress swamps, this plant, among many others new to the members of our party, was found. Puzzled as to its identity, I sent a specimen to Mrs. Chase who most kindly named it for me and added that it represented a new addition to our flora. Having been found along the border states (Arkansas, Texas and Louisiana) its extension into Oklahoma merely emphasizes the fact that, although collections from this area have been made in the past, there is nothing like a complete knowledge of the flora. Additional new plants will, from time to time, be recorded in these papers.

PASPALUM CILIATIFOLIUM Michx. CADDO COUNTY: dry sandy bed of South Canadian River near Hinton, *Hopkins*, no. 2053.

Although primarily a Coastal Plain species, its occurrence in central Oklahoma can best be explained by the fact that it migrated up the river from Arkansas. The South Canadian flows into the Arkansas River not far from the state line and although this plant was found approximately 150 miles west of that point, such migrations are not unusual in our flora. The large rivers seldom possess much water except during the spring and fall and their broad sandy beds, often a mile wide, harbor numerous interesting plants, both

from the east and from the west. Mrs. Chase, again, has vouched for the determination, the collection being the first from within the state.

Chloris cucullata Bisch. Kiowa County: dry sterile sandy hillside near Snyder, *Hopkins & Van Valkenburgh*, no. 858.

Although new to Oklahoma, it is not out of the limits of its natural range in Texas and New Mexico. I have specimens from Wilbarger County, Texas, on the border of the Red River, and as Kiowa County is not far from the state line, the occurrence of the plant on Oklahoma soil should evoke no interest save to emphasize again the paucity of our floristic knowledge. Collections from the southwestern counties have been so few that they can be numbered on the fingers of one hand.

Arabis dentata (Torr.) T. & G. Muskogee County: Hyde Park, *Mrs. E. L. Little*, no. 861.

Although collected in 1927, this specimen was labelled *Iodanthus pinnatifidus* (Michx.) Steud., and being filed in the folder containing plants of that genus, I did not chance upon it until very recently. It extends the known range of *A. dentata* approximately 100 miles southwestward and represents its first collection from Oklahoma. Inasmuch as E. L. Little, Jr., deposited most of his duplicates in this herbarium and seldom sent them elsewhere, I was unable to see this specimen when working on my monograph of *Arabis*.

Arabis glabra (L.) Bernh.—A Correction. In my recent paper, "*Arabis in Eastern and Central North America*," I incorrectly included this species in the floras of Missouri and Arkansas. Dr. Julian A. Steyermark, of the Field Museum, recently wrote me regarding this fact and requested that I again examine the specimens cited from these states to ascertain whether they were *A. glabra* or whether they belonged to another species. Accordingly, I requested a short loan of these plants and was soon convinced of my previous error. The specimen collected by *A. S. Hitchcock* from Jefferson Barracks, Missouri, on May 6th, 1890, and cited by me[1] as *A. glabra* is *A. pycnocarpa* Hopkins var. *adpressipilis* Hopkins, and the plant collected by *H. E. Hasse* at Little Rock, Arkansas in April, 1885, likewise cited as *A. glabra*, is *A. pycnocarpa* Hopkins var. *typica* Hopkins. Both specimens are in the late flowering stage and each superficially resembles *A. glabra*, but a thorough examination reveals that they do not belong to this species. *A. glabra*, therefore, does not occur either in Missouri or Arkansas, at least insofar as I am able to discern at the

[1] Rhodora xxxix. 108 (1937).

present time. I am deeply grateful to Dr. Steyermark for pointing out this error.

ARABIS VIRIDIS IN OKLAHOMA AND WISCONSIN.—I originally reported only one station for this plant in Oklahoma,[1] but later collections have materially added to my previous knowledge. It abounds in the Wichita Mountains in Comanche County, and has also been found in Cherokee County in the eastern part of this state. Regarding it as a typical Alleghenian plant I was greatly puzzled at its appearance in a region so remote from its normal climatic environment. Also isolated in the Wichitas are several other eastern species, notably *Phryma leptostachya* and *Arisaema dracontium*. These latter two, as well as *Acer saccharum* and *Epilobium coloratum* (to be discussed in a following paragraph) occur in Caddo Canyon, a deep canyon in the open prairies near the township of Hinton, in the geographic center of the state and far out of their normal range. The sugar maple is famous at that spot, but the *Arabis* appears absent. The situation is, briefly, this. The presence of Alleghenian plants in the Wichitas and in Caddo Canyon, approximately 150 and 200 miles west of the normal limits of their ranges, indicates that they must, at some time in the past, have had an uninterrupted distribution from eastern Oklahoma (with its flora essentially Alleghenian) westward and that this distribution was altered due to geological or climatic factors. Anthropologists, climatologists and ecologists agree that about 4,000 B. C. there was a period of moist humid climate throughout Oklahoma and that many plants had such a continuous range from east to west. With the advent of a xeric climate, like that possessed today by the Wichitas and Caddo Canyons, those plants preferring a moist and cooler environment could not exist, except at those sheltered stations which they occupy at the present time, and hence were eradicated. Sears[2] and Clements[3] postulate this hypothesis, and because of the absence of any geological evidence which would otherwise explain the ranges of the plants under consideration, I can heartily concur. Theoretically one would anticipate *Arabis viridis* in the Arbuckles, 60 miles east and slightly more to the south, for this region of lime-

[1] l. c.

[2] Sears, P. B., "Climatic change as a factor in forest succession." Journ. For. xxxi. 934–942 (1933).

[3] Clements, F. E., "Origin of the desert climax and climate." Essay in Geological Botany, in honor of William Albert Setchell, ed. T. H. Goodspeed, 87–140 (1936). University of California Press.

stone hills most certainly should offer a veritable paradise for the plant. But the Arbuckles are considerably lower than the Wichitas, and have few sheltered localities where the plant could obtain sufficient moisture for its needs. Plant collection in that region has been exceedingly active, due to its close proximity to several institutions of collegiate rank, and students on field trips (in taxonomy, in ecology, in zoology and in geology, as well as in several other "ologies") have perused the area with considerable zeal. Surely the *Arabis* would have been found by this time, if it occurred there! The Wichitas, on the other hand, offer numerous shady cliffs in deep woods where the plant can grow successfully, though seldom on limestone, as the Wichitas are chiefly granitic, and in its present environment it must be considered as a climatic relic.

Dr. J. F. Hermann of the University of Michigan recently sent me some specimens of *Arabis* which he collected in the summer of 1937 from south-central Wisconsin. Among them was a plant which is clearly *A. viridis*, the first station for this species from that state. Its presence in the famous Driftless Area adds another plant to the lengthy list of relics occurring there. Before attempting to postulate reasons for its presence in that region I should like to see more material, as Hermann's plant is only in anthesis, and the inflorescence is extremely lax, whereas in typical *A. viridis* the inflorescence is of close, compact racemes. In other characters, however, the specimen is typically *A. viridis*. Under the citation of specimens in my paper it will, therefore, be necessary to insert the following:

Wisconsin: northwest of Merrimack, Baraboo Range, Sauk County, *Hermann*, no. 8760.

Lepidium campestre (L.) R. Br. Tulsa County: in an open fallow field near Tulsa, *Luckhardt*, no. 184.

Although undoubtedly occurring elsewhere in the state, this common introduced European weed has never been incorporated into any published flora or checklist of Oklahoma, nor does Stevens mention it in his lengthy manuscript flora. If common weeds are not to be found in our local herbaria what good are such collections to the farmer and garden enthusiast who wishes to know what particular plant is taking over his field or perennial border?

Lespedeza intermedia f. Hahnii (Blake) Hopkins. Cleveland County: in open prairies, 3 miles southeast of Norman, *Pauline Hoisington*, no. 60.

The first collection of the form with spreading pubescence. I have seen no other specimens of this plant although Miss Hoisington tells me that she found numerous individuals together with the typical form of the species. This bears out my original contention[1] that f. *Hahnii* should be treated as a form rather than as a variety as there is no geographic segregation between the two.

EPILOBIUM COLORATUM Muhl. CANADIAN COUNTY: rich moist soil at bottom of Devil's Canyon, near Hinton, *E. L. Little Jr.*, no. 3996.

When Dr. Little sent this specimen to me for examination I was greatly surprised at its occurrence in central Oklahoma for it was supposed to reach its southwestern limit in Missouri and Kansas. This station extends its range approximately 150 miles southward. Little, who has adequately discussed the botany of Devil's Canyon,[2] considers the "relic flora [climate] hypothesis," mentioned above, the only plausible explanation for the presence of any eastern plants in the center of a prairie environment. Sugar maple (*Acer saccharum*) is found in four of the canyons peculiar to the region, its discovery in 1913 by G. W. Stevens being a noteworthy extension of range. Little, giving his explanation of the flora of these canyons says in part: "The most reasonable explanation is the relic flora hypothesis which has been used to account for disjunct patches of plants of various species driven south by ice sheets to be left there as glacial relics and those of prairie species left farther eastward during periods of dry climate.—It is reasonable that during humid periods of various fluctuations in past climates the eastern deciduous forest may have migrated further west. If so, sugar maples may have had a continuous range westward to these canyons and beyond; with the advent of a drier climate, plants of the more mesophytic species would die out at their limits and the limits of the ranges would shift eastward." Such a postulation for the presence of *Acer saccharum* in these canyons seems quite plausible and I think the same argument must hold for the *Epilobium*. If wind carried the seeds, surely intermediate stations between those of Kansas and Missouri would be found. Stevens, whose familiarity with the flora of northern and north-central Oklahoma was greater than that of any other local botanist of his time, fails to record it at

[1] RHODORA XXXVII, 264–266 (1935).

[2] Little, E. L., Jr. "The vegetation of Caddo Canyons, Oklahoma," unpublished manuscript in the Library of the University of Oklahoma (1937). [There are four large canyons, Devil's being the largest and most unique.]

any locality within the state. I also have collected in that interesting spot on several occasions but it has eluded me, although I made one trip with the specific intent of finding it! Except for the one specimen collected by Little, and deposited in this herbarium, no other record for it seems extant.

Aster spinosus Benth. Cleveland County: in sandy meadow on margin of bank of South Canadian River near Norman, *Charles Smith*, no. 701.

This interesting plant of New Mexico and Texas was found in September, 1937. I went with Mr. Smith to his station and found several large clumps which appeared to be several years old and which were apparently brought in by one of the annual floods which are characteristic of the South Canadian. No other record of its appearance in Oklahoma, or at any other locality so far east, is familiar to me.

NOTEWORTHY PLANTS OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from p. 424*)

Rubus occidentalis L. Sussex County: rich deciduous woods south of Stony Creek, no. 8303. Noted locally eastward to Surry County.

*R. phoenicolasius Maxim. Southampton County: alluvial woods, bottomland of Three Creek, Drewryville, no. 7880.

*Rubus (Cuneifolii) **Longii,** sp. nov. (tab. 521 et 522), arcuato-adscendens vel deinde depressus; turionibus 6 dm. altis pilosis glabratisque aculeis 4–6 mm. longis basi dilatatis rectis numerosis armatis; foliis primariis 3-foliolatis longe petiolatis, petiolis cinereo-villosis remote armatis, foliolis imis 5–7 cm. longis 3.5–5 cm. latis oblique rhomboideo-ovalibus lobatis vel divisis subtus densissime cinereo-tomentosis supra dense pilosis abrupte acuminatis grosse duplicato-serratis basi subcuneatis integrisque; foliolis terminalibus elliptico-ovatis vel obovatis basi rotundatis; caulibus fructiferis valde arcuatis; foliis trifoliolatis, foliolis ellipticis 2.5–3.5 cm. longis subtus cinereo-pilosis anguste serratis; inflorescentia corymbiformi basi foliosa; rhachibus villoso-tomentosis; pedicellis valde adscendentibus villoso-tomentosis plus minusve armatis; sepalis oblongis tomentosis apice breviter caudatis; fructibus subglobosis 1.7–2 cm. diametro.—Sussex County, Virginia: bushy margin of a peaty and argillaceous swale north of Littleton, June 10, 1938, *Fernald & Long*, no. 8298 (type in Herb. Gray; isotype in Herb. Phil. Acad.).

Photo. H. G. Fernald.

RUBUS LONGII: fruiting branch from TYPE, × 1.

Photo. H. G. Fernald.

RUBUS LONGII: FIG. 1, portion of primocane, × ¾; FIG. 2, base of petiole, × 4; FIG. 3, upper surface of leaf, × 10; FIG. 4, lower surface of leaf, × 10.

Rubus Longii is so distinctive a blackberry that it at once won the enthusiasm of my companion, who, ordinarily, was as willing as I to pass the average run of *Rubus* (except to test the fruits, in *R. Longii* of superior quality). In its primocanes, with their leaves chiefly 3-foliolate, it is apparently a member of the *Cuneifolii*. From the stiffly ascending *R. cuneifolius* Pursh, which has smaller subtruncate to round-tipped leaflets white-pannose beneath, it differs at once in the larger abruptly acuminate leaflets with a longer cinereous tomentum beneath, and its corymbs have acuminate-tipped leaflets and fewer prickles. Furthermore the fruiting canes are low-arching to depressed. Bailey, Gentes Herbarum, ii. fasc. vi. (1932), recognizes, besides *R. cuneifolius*, three species of the *Cuneifolii*. *R. audax* Bailey, a "diffuse open tall harsh crabbed briar" of southern Florida, has the leaflets of the floricanes strongly rounded, instead of acuminate. *R. probabilis* Bailey, which occurs in eastern Virginia, is a taller shrub with leaflets of the glabrous primocanes oblong, often in 5's, and glabrous (instead of pilose) above, the inflorescence strongly armed. *R. inferior* Bailey, a prostrate or diffuse plant of Florida, has narrower and smaller leaflets without acumination and strongly armed pedicels.

If *Rubus Longii* be sought in the *Arguti* it might be placed near *R. frondosus* Bigel. or with *R. multispinus* Blanchard. Both of these are much coarser and larger-leaved plants, with glabrous primocanes bearing chiefly 5-foliolate leaves with glabrous petioles; *R. Longii*, a much smaller plant, having pilose primocanes with mostly 3-foliolate leaves strongly pilose above, cinereous-tomentulose beneath and on densely villous petioles.

The type-station of *Rubus Longii* is our only locality in Virginia for *Polygala ramosa* and *Acerates floridana*. See p. 398.

ALCHEMILLA MICROCARPA Boiss. & Reut. NORFOLK COUNTY: near Norfolk, May 15, 1832, *Wm. Darlington*. PRINCESS ANNE COUNTY: sandy open ground near beach, Virginia Beach, May 17, 1912, *B. L. Robinson*, no. 325. HENRICO COUNTY: "Hollywood," Richmond, May 5, 1894, *J. R. Churchill*. BEDFORD COUNTY: without stated locality, June 3, 1871, *A. H. Curtiss*.

This is the little annual (of § *Aphanes*) which has passed in eastern America as *Alchemilla arvensis* (L.) Scop. It is abundantly distinct from the European *A. arvensis* in its small leaves and minute flowers. Rydberg, taking it for an endemic native of the South, described it as

Aphanes australis Rydberg in N. Am. Fl. xxii. 380 (1908); but it perfectly matches the southern European (of Spain, Sardinia, etc.) *Alchemilla microcarpa* Boissier & Reuter. It was doubtless early introduced into the South and such habitats noted on labels, as "low pasture," "door-yard," etc., definitely suggest that it is an introduced weed. Dr. Lily M. Perry kindly calls my attention to an earlier reduction of *Aphanes australis* Rydb. to *Alchemilla microcarpa* by Rothmaler in Fedde, Repert. xxxviii. 40 (1935).

Rosa carolina L. (*R. humilis* Marsh.). Seen by us only rarely on the Coastal Plain of Virginia. Dinwiddie County: border of swampy woods east of Burgess, no. 8304. Noted in Greensville County.

R. carolina, var. glandulosa (Crépin) Farwell. Seen by us only once on the Coastal Plain of Virginia. Greensville County: rich deciduous woods by Metcalf Branch, east of Emporia, no. 8305. See p. 380.

Crotalaria angulata Mill. (*C. rotundifolia* (Walt.) Poir.). To the stations in Nansemond and Isle of Wight Counties add two from Southampton County: border of sandy woods about 3 miles east of Drewryville, no. 7455; dry sandy pine and oak woods about 7 miles south of Franklin, no. 8312.

I am indebted to Dr. H. A. Senn for calling my attention to the earliest name for the species.

C. Purshii DC. To the stations already reported add two in Southampton County: border of sandy woods, Hart's Bridge, no. 8313, exceptionally large plants, with stems up to 4.5 dm. high; border of sandy woods, Mars Hill Church, no. 9063, plants 6 dm. high! See p. 378.

*C. spectabilis Roth (*C. Retzii* Hitchc.). Sussex County: dry field, Homeville, no. 7456. See p. 372.

*Wisteria sinensis Sweet. Sussex County: woods, south of Littleton, thoroughly naturalized, climbing high over trees, no. 7883 (misidentified as *W. floribunda*).

Astragalus canadensis L. Extending down the James to Surry County: rich alluvial woods and thicket back of sand-beach of James River, Claremont Wharf, no. 8317; similar habitat, below Sunken Meadow Beach, no. 8318. See p. 383.

Desmodium pauciflorum (Nutt.) DC. Southampton County: alluvial woods, bottomland of Meherrin River, near Haley's Bridge, no. 8319. Sussex County: alluvial woods, upper terrace of Nottoway River, southwest of Burt, no. 7462. Surry County: dry woods northwest of Surry, no. 8726. Apparently general in alluvium.

D. tenuifolium T. & G. To the first Virginian station (in Isle of Wight County) add from Dinwiddie County: sphagnous bog about

1 mile northeast of Burgess, no. 7473. SUSSEX COUNTY: sphagnous depression just northwest of Wakefield, no. 8730. GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, no. 8731.

*DESMODIUM CILIARE (Muhl.) DC., var. **lancifolium** Fernald & Schubert, var. nov. (TAB. 523), foliolis lanceolatis apice attenuatis, terminalibus 2–3.3 cm. longis ca. 1 cm. latis.—VIRGINIA: dry sand, pine barren about 7 miles south of Franklin, Southampton County, September 7 and 8, 1937, *Fernald & Long*, no. 7474 (TYPE in Gray Herb., ISOTYPE in Herb. Phil. Acad). See p. 366.

With the characteristic fruit of *Desmodium ciliare* (*D. obtusum* of authors), which has oval to round-ovate obtuse leaflets. As shown by Urban and subsequently by Blake (Bot. Gaz. lxxviii. 276) the type of *Hedysarum ciliare* Muhl. belongs to the species which has been passing as *Desmodium obtusum* (Muhl.) DC., while the type of *H. obtusum* Muhl. is not conspecific with it.

*LESPEDEZA CUNEATA G. Don. Roadsides and borders of woods, rather general. The following collections have been made: DINWIDDIE COUNTY: roadside gutter, border of swampy woods northwest of Carson, no. 7478. PRINCE GEORGE COUNTY: argillaceous roadside near Gary Church, no. 7479. SURRY COUNTY: roadside, Claremont Wharf, no. 8320.

Tall, erect annual from Asia, with white corolla, the standard with a blue-purple band. Originally introduced as a field-crop.

LESPEDEZA ACUTICARPA Mackenzie & Bush. To the station in Princess Anne County (first from Atlantic slope) reported by Fernald & Griscom, RHODORA, xxxvii. 167 (1935) add from NORTHAMPTON COUNTY: dry pine woods near Capeville, *F. L. & F.*, no. 5333.

*LESPEDEZA CAPITATA Michx., var. **hirtiformis**, var. nov. (TAB. 524), caule dense velutino; foliolis late elliptico-ovalibus vel obovatis utrinque sericeis.—VIRGINIA: border of dry woods, Zion's Church, northwest of Whaleyville, Nansemond County, September 17, 1937, *Fernald & Long*, no. 7481 (TYPE in Gray Herb., ISOTYPE in Herb. Phil. Acad.). PLATE 524, × 2/5. See p. 367.

Lespedeza capitata, with its short peduncles, densely capitate-spicate inflorescences and long calyx, throughout its broad range usually has narrowly oblong to narrowly lanceolate or linear leaflets. We have never before met it on the Coastal Plain of Virginia, except in the narrowest-leaved extreme, var. *longifolia* (DC.) T. & G. (with linear leaflets). Var. *hirtiformis* in its very broad rounded leaflets closely simulates *L. hirta* (L.) Hornem.; but its short peduncles, capitate spikes and large calyx place it clearly with *L. capitata*. The

colony near Whaleyville (a few miles west of the Great Dismal Swamp) is extensive.

*STYLOSANTHES RIPARIA Kearney, var. **setifera**, var. nov., a forma typica recedit caulibus plus minusve hirsuto-setiferis, setis horizontaliter divergentibus 1–2 mm. longis; corollis lacteis.—VIRGINIA: dry thicket by Ivor Road, east of Courtland, June 10, 1938, *Fernald & Long*, no. 8321 (TYPE in Gray Herb.; isotypes in Herb. Phil. Acad. and elsewhere).

When we first detected this white-flowered plant, forming a colony adjacent to typical yellow- or orange-flowered *Stylosanthes riparia*, we took it to be an albino. Upon examining the specimens as they went into press it was found that their stems bore stiff setiform divergent hairs suggestive of the pubescence of *S. biflora* (L.) BSP., var. *hispidissima* (Michx.) Pollard & Ball. Accordingly, we returned to the station, expecting to find the yellow-flowered plant hispid. It proved to be perfectly typical, however, in having the stems only minutely pilose or puberulent; but all the white-flowered plants had hispid stems. The plant cannot, therefore, be treated merely as an albino.

A small colony of a true albino form of the species was found in July; this is

*S. RIPARIA Kearney, forma **ochroleuca**, f. nov., a forma typica recedit petalis ochroleucis.—VIRGINIA: a few plants among typical orange-flowered ones, dry border of woods about 1 mile north of Skipper's, Greensville County, July 15, 1938, *Fernald & Long*, no. 8732 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.).

VICIA CAROLINIANA Walt. Apparently local on the Coastal Plain. GREENSVILLE COUNTY: dry rich woods near Metcalf Branch, east of Emporia, no. 7886. SOUTHAMPTON COUNTY: dry woods, thickets and clearings along Three Creek, Drewryville, no. 5813.

LATHYRUS HIRSUTUS L. To the first reported Virginian station (in Henrico County) add from SURRY COUNTY: roadside thicket, Claremont Wharf, no. 8324.

PHASEOLUS POLYSTACHYUS (L.) BSP. Rare on the Coastal Plain. PRINCE GEORGE COUNTY: dry wooded slopes of gullies near Powell's Creek, Garysville, no. 8325. SOUTHAMPTON COUNTY: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, nos. 8326, 8736. DINWIDDIE COUNTY: borders of dry pine and oak woods, south of Burgess Station, no. 9080. See p. 380.

Very often *Phascolus polystachyus* has forking racemes or even panicles. Our material closely matches the Clayton specimen (type of the species) in having them quite simple.

Photo. H. G. Fernald.

DESMODIUM CILIARE, var. LANCIFOLIUM, × ½.

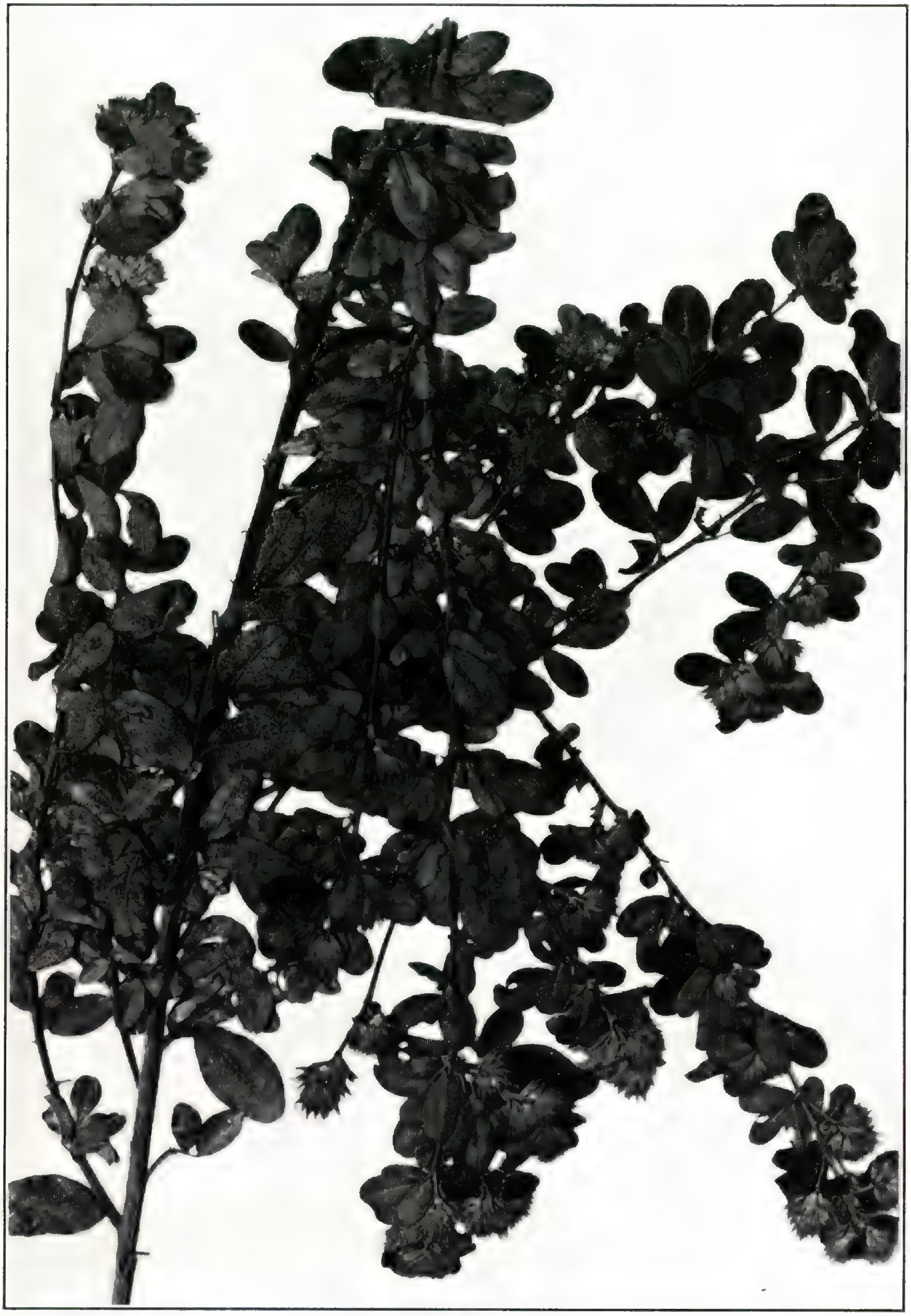


Photo. H. G. Fernald.

LESPEDEZA CAPITATA, var. HIRTIFORMIS: TYPE, × 2/5.

Polygala Harperi Small. To the first Virginian stations (in Sussex County) add stations from three other counties. Nansemond County: damp sandy field north of Factory Hill, *F. & L.* in *Plantae Exsiccatae Grayanae* (not yet issued). Greensville County: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 4336. Surry County: border of oak woods southwest of Surry, no. 8752.

*P. cruciata L., var. cuspidata Wood (Var. *ramosior* Nash; *P. cuspidata* Hook.; *P. ramosior* (Nash) Small). Sussex County: moist pinelands just southeast of Waverly, no. 7501. Southampton County: clearing in wet argillaceous pineland northeast of Courtland, no. 7503. Other collections transitional. See p. 366.

P. verticillata L., *sensu* Fernald in Rhodora, xl. 337, pl. 501 (1938). *P. Pretzii* Pennell. Greensville County: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 8754. See p. 377.

In his study of the group Pennell (Bartonia, no. 13: 12–15 (1931)) cites the prevailingly inland *Polygala Pretzii* (true *P. verticillata* L., as shown in Rhodora, l. c.) from no Coastal Plain station south of New Jersey. Our plant is thoroughly typical, although it passes by free transitions into the next, which in turn passes into the newly described variety.

P. verticillata L., var. ambigua (Nutt.) Wood (*P. ambigua* Nutt.). Greensville County: peaty and argillaceous clearing about 4 miles southeast of Emporia, nos. 8333, 8755. Prince George County: dry sandy woods and clearings about 3 miles southeast of Petersburg, at head of Poo Run, no. 6650. Dinwiddie County: clearings and borders of pine and oak woods south of Burgess Station, no. 9086. See p. 377.

In his study of the group above referred to Pennell (p. 16) cites this commonly inland variety (as *P. ambigua* Nutt.) from no Coastal Plain stations south of New Jersey, its southeastern stations indicated as close to the Fall Line. Our three stations are on the Coastal Plain of southeastern Virginia. Several specimens in the Gray Herbarium, determined by Pennell as *P. ambigua*, from Missouri, Arkansas and Oklahoma, depart conspicuously from it in their very large white wings. Attention was called to this undescribed plant by our finding it also in Greensville County, Virginia. This is

*P. verticillata L., var. **dolichoptera**, var. nov. (tab. 525, fig. 1 et 2), var. *ambiguae* similis; floribus lacteis; alis ellipticis 2–2.6 mm. longis quam capsula valde longioribus.—Virginia, Missouri, Arkansas and Oklahoma. Virginia: peaty and argillaceous clearing about 4 miles southeast of Emporia, Greensville County, June 18, 1938, *Fernald & Long*, no. 8334 (type in Herb. Gray; isotypes in Herb.

Phil. Acad. and elsewhere), July 14, 1938, *Fernald & Long*, no. 8756, also in *Plantae Exsiccatae Grayanae* not yet issued. MISSOURI: Green County, July 23, 1897, *J. W. Blankinship;* woods, Eagle Rock, August 7, 1905, *Bush*, no. 3159; rocky woods, Noel, August 7, 1908, *Bush*, no. 5057. ARKANSAS: dry hills, southern Arkansas, *F. L. Harvey*, no. 101; dry and rocky floor of Maumel Mt., Pulaski County, October 16, 1931, *Delzie Demaree*, no. 8580; open woods, North Mt., Hot Springs, September 6, 1935, *F. J. Scully*, no. 266. OKLAHOMA: rocky creek-bank, Page, Laflore County, June 20, 1914, *O. W. Blakley* (*G. W. Stevens*, no. 1437). See p. 377.

Var. *dolichoptera* has the habit of *Polygala verticillata*, var. *ambigua* but its flowers (FIGS. 3 and 4) are much larger, var. *ambigua* having the wings only 1–1.5 mm. long and about equaling the capsule (FIG. 4). The bright- or milk-white flowers of var. *dolichoptera* are striking, though not wholly distinctive, for they show a tendency in age to change to pinkish. The plants are tall for any form of *P. verticillata*, the larger loosely bushy-branched plants of our no. 8756 being fully 4 dm. high.

STILLINGIA SYLVATICA L. SOUTHAMPTON COUNTY: dry open sandy pine and oak woods 6 to 7 miles south of Franklin, locally abundant, nos. 7508, 8337, 8338. See p. 380.

EUONYMUS ATROPURPUREUS Jacq. SURRY COUNTY: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8357. See p. 382.

*CELASTRUS ORBICULATUS Thunb. CAROLINE COUNTY: thoroughly naturalized in fence-row south of Milford, no. 7524. See p. 365.

An Asiatic species, becoming naturalized as far north as southeastern New York.

STAPHYLEA TRIFOLIA L. Extending locally into the Coastal Plain. SURRY COUNTY: rich wooded gullies along James River, below Sunken Meadow Beach, no. 8358 (trunks up to 7.5 m. high and 7 cm. in diameter). SUSSEX COUNTY: alluvial woods, Nottoway River, southwest of Lambs, no. 7525. GREENSVILLE COUNTY: rich deciduous woods along Three Creek, north of Emporia, no. 8359. See p. 382.

ACER FLORIDANUM Pax. GREENSVILLE COUNTY: abundant in rich deciduous woods by Metcalf Branch, east of Emporia, no. 8360. AMELIA COUNTY: alluvial woods along Deep Creek, about 1 mile southeast of Beaver Pond, no. 9096 (station shown us by Mr. John B. Lewis). See p. 380.

Small (Man.) says "Fla. to La. and S. C. Naturalized in N. C. Reported from Va." At our station it is the dominating tree in an extensive area of undisturbed (except for cutting) forest, with a striking group of local natives: *Scleria oligantha, Carex flaccosperma,*

Silene virginica, Clematis ochroleuca, Rosa carolina var. *glandulosa, Aesculus discolor, Phlox nivalis, Phacelia dubia* and *Coreopsis auriculata*, while the wooded bottomland close by supports an extensive area of isolated *Glyceria arkansana*. Sargent (Man. Trees, ed. 2) reports *Acer floridanum* from near McKenney, Dinwiddie County; and Mr. Lewis told us of a second station in Amelia County.

AESCULUS DISCOLOR Pursh. GREENSVILLE COUNTY: dry rich woods and bottomland-woods by Metcalf Branch, east of Emporia, nos. 7895, 7894. See p. 374.

These flowering specimens confirm the identification in RHODORA, xxxix. 352 and 435. The station was there erroneously given as Caney Branch (which crosses the Courtland road to the east of Metcalf Branch).

*VITIS CINEREA Engelm. GREENSVILLE COUNTY: alluvial woods, bottomland of Meherrin River, near Haley's Bridge, no. 8363. See p. 375.

Apparently the first on the Atlantic slope from north of Florida, although the rufescent var. *floridana* Munson (*V. Simpsoni* Munson; see RHODORA, xxxviii. 426), cited by Small only from Florida and by Bailey as extending north into Georgia, is abundant on practically all bottomlands.

V. VULPINA L. Following the James at least to SURRY COUNTY: rich alluvial woods and thicket back of sand-beach of James River, Claremont Wharf, no. 8361; seen also at Eastover. See p. 375.

TILIA MICHAUXII Nutt. SURRY COUNTY: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7897; rich woods and thickets back of sand-beach of James River, Eastover, no. 8763. See p. 375.

A species of the interior, Sargent (Man. ed. 2) saying "southward . . . along the Appalachian Mountains." Leaves cordate-ovate, loosely pubescent beneath.

T. HETEROPHYLLA Vent. SURRY COUNTY: with the last, no. 8365. See p. 375.

Tall tree; leaves strongly oblique, permanently white-felted beneath. Also an upland tree, Sargent, l. c., giving the northeastern areas of its range: "White Sulphur Springs, Greenbrier County, West Virginia; Piedmont region of North and South Carolina and Georgia." The tree is not, however, new to Virginia. Several collections from the western half of the state are represented in the Gray Herbarium.

*Malva rotundifolia L., not of most American authors (*M. pusilla* With., *M. borealis* Wallm.). See C. V. Morton, Rhodora, xxxix. 99 (1937). Dinwiddie County: waste place, Petersburg, no. 8366.

Hypericum prolificum L. Surry County: rich woods and thicket back of the sand-beach of the James River, below Sunken Meadow Beach, no. 8368. Prince George County: locally very abundant in low open woods, Flowerdew Hundred, no. 8769, shrubs up to 2.5 m. high. Charles City County: alluvial woods by James river, Harrison Point, no. 9100. See p. 382.

An inland and upland species apparently not recorded from the Coastal Plain.

H. nudiflorum Michx. Reported, Rhodora, xxxvii. 432 (from Princess Anne County), as new to Virginia. Now known as a scattered shrub nearly to the Fall Line, in Nansemond, Sussex and Dinwiddie Counties (many nos.).

*H. adpressum Bart. Sussex County: border of a wooded swamp north of Stony Creek, nos. 8367, 8767.

First in the Gray Herbarium from between Delaware and North Carolina.

H. denticulatum Walt., var. ovalifolium (Britton) Blake. To the first Virginian station (in Sussex County), reported in Rhodora, xxxix. 337 and 435 add the following. Isle of Wight County: sandy and peaty border of Cat Pond, south of Benns Church, no. 7530. York County: borders of small pond-holes in woods, northwest of Grafton, no. 7531. See p. 371.

H. setosum L. Sussex County: ditch bordering dry argillaceous pinelands about 4 miles northwest of Waverly, no. 7532; moist pinelands just southeast of Waverly, no. 7533, abundant. Greensville County: peaty openings bordering wooded swamp north of Skipper's, no. 9101. See p. 366.

Viola affinis LeConte, var. chalcosperma (Brainerd) Griscom. To the first Virginian record (from Southampton County) should be added one from Nansemond County: alluvial wooded bottomland of Somerton Creek, Factory Hill, no. 8371.

*V. Langloisii Greene, var. pedatiloba Brainerd. Southampton County: dry wooded slopes by Three Creek, Drewryville, no. 7908. See p. 375.

Seemingly quite like the original material from Louisiana.

V. esculenta Ell. To the one reported Virginian station (in Norfolk County) add one in Greensville County: rich woods by Three Creek, 2 miles north of Emporia, no. 7990. See p. 375.

*V. emarginata (Nutt.) LeConte, var. acutiloba Brainerd. Sussex County: dry pine woods east of Burt, no. 7541, quite like

the original material from the District of Columbia. JAMES CITY COUNTY: damp clearing in rich woods south of Hotwater, no. 8780.

V. LANCEOLATA L. SUSSEX COUNTY: sandy woods near Mars Hill Church, no. 7898.

Apparently rare on the Inner Coastal Plain, though common in eastern Princess Anne County and on the Eastern Shore. Grimes did not find it on the Peninsula of Virginia.

V. LANCEOLATA, var. VITTATA (Greene) Weath. & Grisc. To the first Virginian station (in Sussex County) reported add one from ISLE OF WIGHT COUNTY: sandy and peaty border of Cat Pond, south of Benns Church, no. 7543.

VIOLA KITAIBELIANA Roem. & Schultes, var. **Rafinesquii** (Greene), comb. nov. *V. bicolor* Pursh, Fl. Am. Sept. i. 175 (1814), not Gilibert (1781). *V. tenella* Muhl. Cat. 26 (1813) *nomen subnudum;* Eaton, Man. ed. 2: 496 (1818); Raf. in Am. Mo. Mag. iv. 191 (1819); not Poir. (1810). *V. Rafinesquii* Greene, Pittonia, iv. 9 (1899). PLATE 526, FIGS. 1, 2, 4 and 7.

Viola Rafinesquii is the one American representative of the prevailingly Eurasian and north African pansies which has been sometimes considered indigenous with us. Its behavior, however, is so decidedly that of early-established weeds of European, north African or Asiatic origin that its claims to being indigenous in the eastern United States seem no better than those of other weedy species, like *Poa compressa, Allium vineale, Arenaria serpyllifolia, Ranunculus bulbosus, Duchesnea indica, Potentilla argentea, Vicia angustifolia, Rhamnus cathartica, Hypericum perforatum, Ligustrum vulgare, Thymus Serpyllum, Solanum Dulcamara, Linaria vulgaris, Veronica arvensis* and *serpyllifolia, Lonicera japonica, Artemisia vulgaris, Cirsium lanceolatum,* and hundreds of others brought to us from abroad and now thoroughly at home in fields, recent clearings, pastures, open second- to fourth-growth woods near farms, or other altered habitats where they associate with and often crowd out the strictly indigenous plants.

The first record of the American plant was, apparently, by Gronovius, based upon Clayton's collection, in 1739: his "VIOLA caulibus & pedunculis quadratis, stipulis oblongis pinnato-dentatis, foliis ovato-oblongis crenatis. Flore est penitus albo. *Clayt.* n. 527," the identity established by Asa Gray who noted opposite the description in 1839 "*tenella* Pursh" (of course meaning *V. tenella* Muhl. as validated by Eaton, or *V. bicolor* Pursh which was separately named *V. tenella* by Rafinesque in 1819). *V. Rafinesquii* was, then, in Virginia

two centuries ago. It is now a ubiquitous weed especially of roadsides, or in lawns, worn-out fields, pastures and pastured woodlands in many areas from New Jersey and eastern Pennsylvania to Georgia; also occasional to common from Connecticut to Nebraska, south to the Gulf States. If in the 18th century it was as common as today and if it be indigenous through its present extensive area in the Atlantic States, it is most singular that Pehr Kalm, arriving in Philadelphia in 1748 and exploring from that center in the spring of 1749 should not have noted it; that Walter, dating the preface to his *Flora Caroliniana* "ad Ripas Fluvii Santee, 30 Dec. 1787," should not have got it; that Elliott, publishing the section including *Viola* in 1817, should have had it from no station in South Carolina and from only a single station in Georgia, whence it was sent to him.[1] Darby, covering the "Southern States" in different editions from 1841 to 1860, apparently knew of *Viola Rafinesquii* (as *V. arvensis*) only through Elliott's single station for the plant. In 1860, in the first edition of his *Flora of the Southern States*, Chapman, under *V. tricolor*, var. *arvensis*, said "Cultivated ground. Introduced" and he repeated this treatment in the second edition (1883); but in his third edition (1897) he changed to "Open woods and waste places, perhaps indigenous." Many other records from literature could be quoted, all of the same character, indicating that the pretty lavender-flowered "Field Pansy" of eastern North America was not much known to the acute observers of the 18th and the first decades of the 19th century, but that now it is often a ubiquitous weed over large areas. I have noted from the labels of collections of *V. Rafinesquii* in the Gray Herbarium the habitats recorded. 39 numbers have no habitat given. The remainder are as follows: "native," 1; dry open woods, 8; dry sandy hill (or slope), 4; rocky hill (or summit), 3; open rocky soil, 2; bank of creek, 1; meadows, 5; dry fields, 14; clearings, 3; old orchard, 1; pasture, 3; cultivated field, 2; railroad embankment, 2; roadside, 11; waste places, 11. Pursh's *V. bicolor* (1814) came from "fields of Pennsylvania and Virginia." If the plant were indigenous we should expect the overwhelming majority of habitats to be undisturbed or primitive ones and that the species would now be rarer than it was two centuries (or only one century) ago. The majority of habitats are,

[1] Elliott placed his specimen under *Viola arvensis*, defined with "calyx pubescent, rather longer than the corolla"; but he added "*Calyx* ciliate, in my specimens shorter than the corolla . . . My specimens agree exactly with one sent me from Pennsylvania by Dr. Muhlenberg."

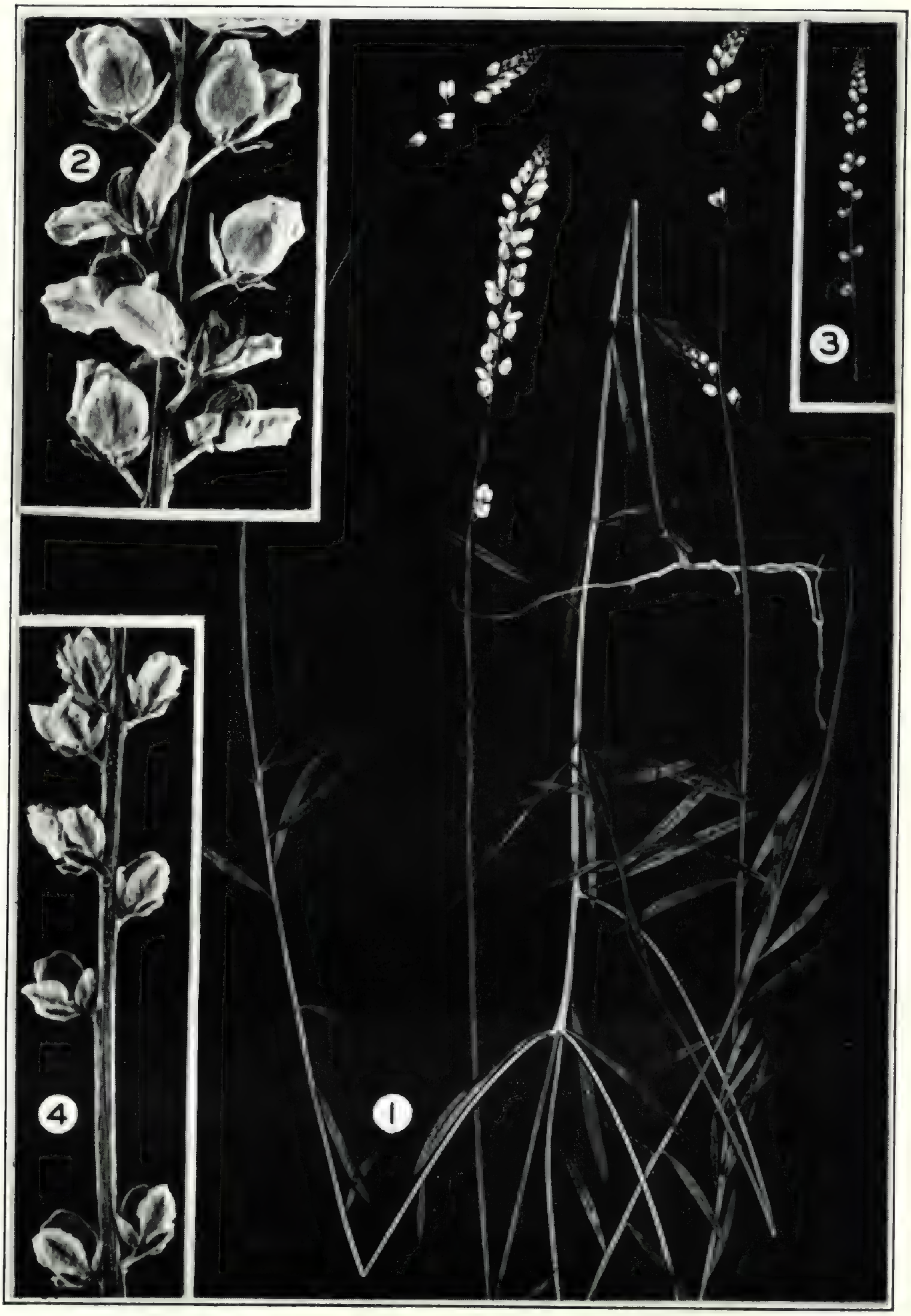


Photo. H. G. Fernald.

POLYGALA VERTICILLATA, var. DOLICHOPTERA: FIG. 1, TYPE, × 1; FIG. 2, portion of raceme, × 6.

Var. AMBIGUA: FIG. 3, raceme, × 1; FIG. 4, portion of raceme, × 6.

Photo. H. G. Fernald.

VIOLA KITAIBELIANA: FIG. 5, flowering plant, × 1, from Switzerland; FIG. 6, fruiting summit, × 1, from Bithynia; FIG. 3, calyx, × 2, from same plant as FIG. 6; FIG. 8, margin of sepal, × 8, from Bohemia.

V. KITAIBELIANA, var. RAFINESQUII: FIG. 1, portion of flowering plant, × 1, from District of Columbia; FIG. 2, portion of plant, × 1, from Pennsylvania; FIG. 7, calyx, × 2, from Pennsylvania; FIG. 4, margin of sepal, × 8, from Pennsylvania.

however, spots cleared by the white man or the negro or disturbed by him, his cattle or his hogs. Mixed in the herbarium with specimens of the *Viola* are often found *Veronica arvensis* or *Stenophragma Thaliana;* and the label of W. Becker's VIOLAE EXSICCATAE, II Lief. 1901, no. 48, of *V. Rafinesquii* is quite typical: "**Flora Americ. boreal:** *Brookland D. C.;* locis graminosis, ad vias, in pratis, frequens. . . . *Begleitpflanzen:* Lamium amplexicaule, Veronica peregrina, Lithospermum arvense, Poa pratensis etc."

It would be a pleasant thought, and by several enthusiastic Americans it has been urged, that we have an indigenous pansy in America. Phytogeographically, however, the pansy-group belongs in a region (chiefly continental and southern Europe and adjacent northern Africa and western Asia) with which the indigenous flora of the temperate eastern United States has little in common. The pansies are native, however, in an area which has supplied many of our long-established and still just arriving weeds. Consequently, my first introduction in the field to *Viola Rafinesquii*, an aggressive weed, monopolizing the uninviting band of thin soil between the rails of the trolley-tracks and the worn-out waste fields and neglected lawns about Richmond, Virginia, coupled with Mr. Long's assurance that in his experience it always looks like a weed, quite upset the impression gained from our manuals of recent years, that the plant is native. In similar habitats in the southeastern states we get the Mediterranean *Alchemilla microcarpa* Boiss. & Reut., which has been mistaken by Rydberg for an endemic American and called *Aphanes australis* Rydb. in N. Am. Fl. xxii. 380 (1908).[1]

Our *Viola Rafinesquii* (FIGS. 1, 2, 4 and 7) strongly suggests in the outlines of its leaves and stipules the southern European *V. Kitaibeliana* Roem. & Schultes (FIGS. 3, 5, 6 and 8) but its leaf-blades are more commonly entire and its lilac- or lavender-tinged petals (FIG.1) are larger than in any specimens of the latter (FIG. 5) in the Gray Herbarium. Knowing that I should get an authoritative identification by sending some Virginian specimens to the distinguished student of the Iberian flora, Mr. A. J. Wilmott of the British Museum, I ventured to put my problem before him. Wilmott's answer follows:

As soon as I saw your specimens of *Viola Rafinesquii* I said to myself that surely they were *Viola Kitaibeliana* Schultes, which is a common ally of *Viola arvensis* Murr. in the Mediterranean region. It differs from *V.*

[1] See discussion on previous page.

arvensis in several characters, notably the short pubescence in the lower part of the plant (stem), the longer narrower terminal lobe of the stipule, the shorter stumpier spur. Usually, however, it has very small flowers, the petals being scarcely or not longer than the sepals, whereas in your specimens they are definitely larger. I find, however, that among the mass of specimens that we received from Macedonia during the war, there are quite a number of specimens that have the petals as large as in your plant. Yours also has the long peduncles, and, to judge from a gathering from Maryland by Blake, which is the only one in the herbarium, they stand out 45 degrees or more from the stem when fruiting, giving a "diverging" effect unlike that usual in *V. arvensis*.

The chief objection to this determination lies in the strongly ciliate margin to the sepals in *V. Rafinesquii* as illustrated by the specimens you sent. Blake's are slightly less markedly so, but even so they are more ciliate than in any of our specimens of *V. Kitaibeliana*. On the other hand, although most sepals in our material of *V. Kitaibeliana* have no ciliate hairs, or very minute and inconspicuous ones, on the margins of the sepals, some (including one of the gatherings with large flowers) has the margins almost as densely puberulous as those of *V. Rafinesquii* are ciliate, and also in some sepals the short hairs are replaced by ciliae just as long as in *V. Rafinesquii*.

The foliage is quite good for *V. Kitaibeliana*, as is also the habit. There is, indeed, almost nothing wrong with that determination except that I cannot exactly match it among our material. Yet one knows that *V. arvensis* is so variable, with many forms, and also *V. Kitaibeliana* is very variable, although the different forms have not been thoroughly worked out if they exist, that I feel that if we had a larger series from all parts, we should be able to find specimens just like *V. Rafinesquii*, and thus possibly find from what part of Europe (or North Africa) it was imported. Those from Macedonia and the Southern Caucasus seem to have the strongest ciliation to the sepals, and also the more frequently larger flowers. I find no other species which it could be from Europe if it is not a form of *V. Kitaibeliana*.

Is the ciliation constant in your plant?

The ciliation (FIG. 4) is essentially constant in the American series. I am unable to find in our series any specimens with so few cilia on the sepals as in the most ciliate calyces (FIG. 8) of the European plant. With Wilmott's prediction in mind, that somewhere in the Mediterranean region exact matches for our plant must be found and considering his statement that quite as large petals sometimes occur in Europe, it seems probable that a rare but unrecognized extreme was early brought from southern Europe or northern Africa and that in a new environment it has become quite stabilized. If this interpretation is correct, then *Viola Kitaibeliana*, var. *Rafinesquii*, rapidly spreading and aggressive in eastern America but rare (in this case perhaps unknown) in Europe takes its place with several other weeds which with us have become vastly more common than they are in the country of their origin.

HYBANTHUS CONCOLOR (Forster) Spreng. SURRY COUNTY: rich woods on fossiliferous sandy slopes of gullies, Claremont Wharf, nos. 7916, 8374. See pp. 375, 382.

An inland type.

DIRCA PALUSTRIS L. SURRY COUNTY: rich woods, slopes of gully 1½ miles north of Surry, no. 8375, the dominant shrub under *Fagus*, reaching a height of 3 m. and trunk-diameter of 7 cm. See p. 383.

In the single extensive area, slopes of a gully tributary to Gray's Creek, the shrub is very abundant. We had seen it nowhere else on the Coastal Plain, nor did Grimes find it on the Peninsula of Virginia.

RHEXIA MARIANA L., var. PURPUREA Michx. Range extended inland to DINWIDDIE COUNTY: sphagnous bog about 1 mile northeast of Burgess, no. 7546.

LUDWIGIA SPHAEROCARPA Ell., var. JUNGENS Fernald & Griscom in RHODORA, xxxvii. 174, t. 348, figs. 3 and 4 (1935). To the type-station at Cape Henry add several new records. ISLE OF WIGHT COUNTY: sandy and peaty border of Cat Pond, south of Benns Church, no. 7547. NANSEMOND COUNTY: canal in Great Dismal Swamp, east of Laurel, no. 8791. SUSSEX COUNTY: swampy clearing north of Stony Creek, no. 8790. GREENSVILLE COUNTY: pool in *Cephalanthus* swamp about 1 mile north of Skipper's, no. 8788. YORK COUNTY: borders of small pond-holes in woods, northwest of Grafton, no. 7548. See p. 371.

L. BREVIPES (Long) E. H. Eames. ISLE OF WIGHT COUNTY: sphagnous border of Cat Pond, south of Benns Church, no. 8376.

Extension inland from Norfolk County.

PROSERPINACA PECTINATA Lam. GREENSVILLE COUNTY: pool in cut-over sphagnous pine and oak woods near Three Creek, north of Emporia, no. 8379. YORK COUNTY: borders of small pond-holes in woods, northwest of Grafton, no. 7552. WARWICK COUNTY: shallow pool in woods, north of Lee Hall, no. 8795. See p. 371.

ARALIA RACEMOSA L. SURRY COUNTY: rich calcareous wooded gullies along James River, Claremont Wharf, nos. 8380, 9112 (3 m. high!). See p. 382.

Found in a similar habitat near Williamsburg by Grimes.

ERYNGIUM YUCCIFOLIUM Michx. SUSSEX COUNTY: dry open sandy pine and oak thickets, near the Greensville County line, south of Jarratt, nos. 8385, 9387. PRINCE GEORGE COUNTY: border of woods north of Talpa, no. 8801. See p. 379.

In regard to the unjustified use of the name *Eryngium aquaticum* for this upland species see Britten & Baker, Journ. Bot. xxxviii. 243 (1900). The species is cited as occurring northward to Connecticut; but in Cat. Fl. Pl. Ferns of Conn. is the note "Introduced from the

South, or possibly native." Except for this presumably adventive colony in a sandy field at Bridgeport, Connecticut ("sparingly naturalized"), Coulter & Rose cite nothing in the East from north of the interior of Virginia.

*SANICULA MARILANDICA L., var. **petiolulata**, var. nov. (TAB. 527), foliolis foliorum 1–2 imorum caulinorum longe petiolulatis, petiolulis 1.5–5 cm. longis.—VIRGINIA: dry sand, pine barrens about 7 miles south of Franklin, Southampton County, September 7 and 8, 1937, *Fernald & Long*, no. 7553 (TYPE in Gray Herb., isotypes in Herb. Phil. Acad. and elsewhere). See p. 366.

Typical *Sanicula marilandica* has the leaflets of the lower (as well as the upper) leaves all sessile or on very short petiolules (rarely up to 1.5 cm. long). The plant in the pine barrens south of Franklin has all the petiolules of the 1 or 2 lower leaves with extraordinarily long foot-stalks. The habitat is likewise extraordinary for any form of the species (ordinarily of damp and rich habitats). The type-colony is under *Quercus laevis* Walt. and *Viburnum rufidulum* Raf.; and close by are characteristic colonies of such pine-barren species as *Aristida virgata* Trin., *Tradescantia rosea*, var. *graminea* (Small) Anders. & Woodson, *Myrica pusilla* Raf., *Asimina parviflora* (Michx.) Dunal, *Stillingia sylvatica* L., *Euphorbia Ipecacuanhae* L., *Opuntia humifusa* Raf., *Phlox nivalis* Lodd., *Carphephorus bellidifolius* Michx. and other species of dry pineland which we ordinarily do not associate with *Sanicula marilandica*.

S. GREGARIA Bicknell. Frequent in rich woods eastward at least to SURRY, SUSSEX and NANSEMOND COUNTIES (many nos.). See p. 382.

*S. SMALLII Bicknell. HANOVER COUNTY: rich woods north of Gum Tree, no. 7554. SOUTHAMPTON COUNTY: rich deciduous woods, northeast of Statesville, nos. 7917, 8384. See pp. 365, 378.

Extension north from North Carolina.

CHAEROPHYLLUM TAINTURIERI Hook. GREENSVILLE COUNTY: weed in freight-yard, Emporia, no. 7920.

C. PROCUMBENS (L.) Crantz. Extending locally into the Coastal Plain in SURRY COUNTY: by brook in drained cypress swamp, Claremont Wharf, no. 7921.

OSMORHIZA LONGISTYLIS (Torr.) DC., var. VILLICAULIS Fern. SURRY COUNTY: rich calcareous wooded gullies by James River, Claremont Wharf, no. 8386; similar habitat below Sunken Meadow Beach, no. 8387. See p. 383.

The plant with glabrous stems not seen.

CRYPTOTAENIA CANADENSIS (L.) DC. In rich deciduous (chiefly

calcareous) woods eastward to SUSSEX and SURRY COUNTIES (many nos.). See p. 382.

THASPIUM BARBINODE (Michx.) Nutt. SURRY COUNTY: rich wooded slope at head of Sunken Meadow Creek, south of Claremont, nos. 7922, 8390; seen in similar habitat at Eastover. SUSSEX COUNTY: moist woods bordering Assamoosick Swamp, about 2 miles northeast of Homeville, no. 9114. See pp. 375, 382.

OXYPOLIS RIGIDIOR (L.) Coult. & Rose. Localized in sphagnous boggy depressions of DINWIDDIE, PRINCE GEORGE, SUSSEX and GREENSVILLE COUNTIES (many nos.), and doubtless elsewhere. See p. 367.

In southeastern Virginia *Oxypolis rigidior* is often the quickly visible indicator of a good habitat. Three of its stations have proved to be among the best of sphagnous depressions, with many localized Coastal Plain types present.

RHODODENDRON NUDIFLORUM (L.) Torr., var. GLANDULIFERUM (Porter) Rehder. SOUTHAMPTON COUNTY: bottomland swamp of Nottoway River, Smith's Ferry, no. 7928.

Very rare on the Coastal Plain, Rehder in his *Azaleas of North America*, 138 (1921) saying: "from Massachusetts to northwestern South Carolina and often grows together with the typical form. It seems, however, nearly absent from the southeastern part of the range, that is from the coastal plain from New Jersey to North Carolina and more common West, for the plants I have seen from the extreme Western localities, western Tennessee and southern Ohio, represent this variety though from the last named locality (Lawrence County) and from western New York (Monroe County) I have seen specimens of the typical form."

KALMIA ANGUSTIFOLIA L., var. CAROLINIANA (Small) Fernald. NANSEMOND COUNTY: low pinelands east of Whaleyville, no. 7564.

The known Virginian stations have all been in the Great Dismal Swamp.

EPIGAEA REPENS L. Very local on the Coastal Plain. PRINCE GEORGE, ISLE OF WIGHT, SURRY and SOUTHAMPTON COUNTIES: local colonies too liable to extermination.

HOTTONIA INFLATA Ell. To the few recorded stations add SOUTHAMPTON COUNTY: inundated swamp west of Adams Grove, no. 7944. SURRY COUNTY: shallow water of gum swamp, Blackwater River, south of Savedge, no. 8405.

LYSIMACHIA CILIATA L. Rich deciduous or bottomland woods, eastward to JAMES CITY, SURRY and SUSSEX COUNTIES (many nos.).

FRAXINUS AMERICANA L. Extending eastward along the James to

SURRY COUNTY: below Sunken Meadow Beach, no. 8414. See pp. 375, 382.

F. BILTMOREANA Beadle. DINWIDDIE COUNTY: swampy woods, Poplar Grove (= Poplar Spring) Church, no. 8413. SOUTHAMPTON COUNTY: sphagnous wooded spring-heads east of Emporia, no. 8415. See p. 380.

FRAXINUS TOMENTOSA Michx. f. Hist. Arb. Am. iii. 112, t. 9 (1813). *F. Americana profunda* Bush in Mo. Bot. Gard. Fifth Ann. Rep. 147 (1894). *F. profunda* Bush in Britton, Man. 725 (1901). *F. Michauxii* Britton, Man. ed. 2: 1075 (1905). *F. profunda*, var. *Ashei* E. J. Palmer in Journ. Arn. Arb. xiii. 417 (1932). PLATE 528.

Originally treated as a variation (category not indicated) of *Fraxinus americana*, from which it differs "in the strong pubescence of the shoots, the large size of the leaves, and the very large fruit, the shaft of which is often strongly six-sided," *F. profunda* was further defined in Britton's Manual by its being placed with *F. pennsylvanica* Marsh. and by its larger samara with more decurrent wing. The material distributed by Bush shows that the long-acuminate subcoriaceous leaflets are on definite wingless petiolules (FIG. 3); the samaras (FIG. 4) without sharply defined slender bodies, the mature fruits 4–7.5 cm. long, with wing 6–12 mm. broad; the fruiting calyx rather large for the group. Exactly such trees, though often lower, are abundant along the rivers and in the wooded swamps of eastern Virginia, the specimens identified variously as *F. pennsylvanica* and *F. profunda*, with note sometimes made of the lustrous upper surfaces of the subcoriaceous leaflets. In this tree the petiolules (FIG. 5) are quite as definite as those of *F. americana* but mostly longer (0.5–2 cm. long). In the polymorphous *F. pennsylvanica* (PLATE 529) the petiolules are bordered nearly to their bases by the decurrent tissue of the blades and the fruits have clearly defined slenderly clavate bodies sharply contrasted with the wings which extend only narrowly below the middle.

True *Fraxinus pennsylvanica* Marsh. I take to be the common tree (PLATE 529, FIGS. 3 and 4) of Marshall's region in Pennsylvania, defined by him as having the fruits ("seeds") "longer and narrower than any of the other kinds, almost terminating in a point at their base," for which reason, presumably, he called it "*Pennsylvanian Sharp-keyed Ash.*" The tree, abundantly represented from Marshall's region, was described as *F. Darlingtoniana* Britton, l. c. 725 (1901). It occurs from the warmer valleys of New England to Minnesota,

Photo. H. G. Fernald.

SANICULA MARILANDICA, var. PETIOLULATA, × ½.

Photo. H. G. Fernald.

FRAXINUS TOMENTOSA, lateral leaflet and samaras: FIGS. 1 and 2, after Michaux filius; FIGS. 3 and 4, *P. profunda* from Missouri; FIGS. 5 and 6, from Virginia.

south to Georgia, Alabama and Arkansas, but the only material of it which I have seen from southeastern Virginia is Grimes's no. 3880 from near Williamsburg.

The broader-fruited *Fraxinus profunda*, on the other hand, is represented in the Gray Herbarium by the following Virginia collections: Chickahominy River, near Lanexa, *Grimes*, no. 4126; James River, near Richmond, April 24, 1915, *J. R. Churchill* (in fine staminate flower, showing the subulate tips of the anthers 0.5–1 mm. long, whereas the mucronate tips in *F. pennsylvanica* are only 0.2–0.4 mm. long); swampy woods, London Bridge, Princess Anne County, *Fernald & Long*, no. 4128; Indian Creek, Norfolk County, *Fernald, Griscom & Long*, no. 4690; Appomattox River, near Hopewell, *Fernald, Long & Smart*, no. 5890; Three Creek, Drewryville, *Fernald, Long & Smart*, no. 5891 (FIGS. 5 and 6). Palmer includes in his *F. profunda*, var. *Ashei* specimens from the Potomac Valley and from the Eastern Shore of Maryland, and it may reach southern New York.[1]

The tree is so characteristic of the river-swamps and dismals in southeastern Virginia that it seemed improbable that it should have been overlooked by Michaux and other early collectors who went through the region. André Michaux and his son Francois André, it now seems clear, got it and the younger Michaux described and beautifully illustrated it, his plate showing the wholly characteristic foliage with slender petiolules and the quite distinct fruit. *F. tomentosa* came from "la Pensylvanie, le Maryland et la Virginie" and the illustration (see our FIGS. 1 and 2), presumably from the common tree

[1] I take it that *Fraxinus tomentosa* Michx. fil. also includes *F. Michauxii* Britton, Man. ed. 2: 1075 (1905). Britton's description is satisfactory for it and he originally stated that his *F. Michauxii* (type from southeastern New York) is "*F. tomentosa* Michx. f. Arb. For. **3:** *pl. 9*, but not as to the description there given, which applies to *F. Pennsylvanica*." In view of the very confused ideas regarding what constitute stable characters in the group it is disconcerting to be told that, when Michaux filius illustrated his own new species, he was really illustrating something else. The matter was not really clarified when in his North American Trees, 804 (1908) Britton said of his *F. Michauxii* "The species was illustrated by Michaux as *Fraxinus tomentosa* Marshall." I can find no such name used by Marshall and Michaux (André) did not publish it nor illustrate it; it was first published by Michaux filius (Francois André) and has by everyone, except Britton in this instance, been ascribed to him. Even *F. epiptera* Michx. Fl. Bor.-Am. ii. 256 (1803), commonly treated as identical with *F. americana* L., is open to question. My memorandum made in 1903, when examining Michaux's herbarium, says "Foliage of *F. pennsylvanica*." A photograph of it, daily expected, will settle its identity. One thing seems reasonably settled. The Clayton specimen (a photograph before me) which Linnaeus had before him in preparing his Species Plantarum (1753) and himself marked "*americana*" is a characteristic leaf of *F. americana* as regularly understood. From that one Linnean species on the types of the American species must be studied anew.

of river-swamps of southeastern Virginia, is perfect. Incidentally, *Fraxinus tomentosa* Michx. f. "croît, de préférence, dans les marais, ainsi que dans tous les endroits fréquemment submergé, ou qui sont exposés à l'être par les fortes pluies. . . . se trouve réuni avec les arbres qui, comme lui, aiment les terreins fort humides, tel que le *Juglans squamosa*, le *Juglans amara*, le *Quercus discolor*, l'*Acer rubrum*, le *Liquidambar styraciflua* et la *Nyssa aquatica*." That *F. profunda* Bush (1901), at least as to its eastern phase, is *F. tomentosa* Michx. f. (1813) is unquestionable. Whether it is also *F. pubescens* Lam. (1786) I can more easily tell when a photograph of Lamarck's type reaches me from Paris. It may also prove to be one of the full dozen species of North American *Fraxinus* proposed by Bosc in 1808, chiefly from the southeastern states: *F. rufa*, *F. fusca*, *F. longifolia*, *F. rubicunda*, etc. By an easy wave of the hand, demoting, without examining the types, most of the species proposed by Lamarck, Bosc, Michaux filius and others of 100 to 150 years ago, to the unquestioned synonymy of a few species of Linnaeus, Miller and Marshall, the way was cleared for new propositions of recent date. Until the types of all the early-proposed species have been most intelligently checked the names of our American ashes will remain hopelessly tentative. Had the names been given to Chinese trees their applications would long ago have been settled by American students of woody plants!

FRAXINUS PENNSYLVANICA Marsh., var. **Austini**, var. nov. (TAB. 529 FIG. 1 et 2), ramulis petiolis rhachibusque velutinis; foliolis plerumque dentatis subtus plus minusve rufidulo-pubescentibus; fructibus 2.8–3.7 (rare–4) cm. longis, corpore 1–1.7 cm. longo, ala spathulata 4–8 mm. lata.—Quebec to Manitoba, south to Nova Scotia, New England, northern New Jersey to upland of Virginia, New York, Ohio, Illinois and Iowa. TYPE: bank of St. John River, Ingleside, Westfield, Kings County, New Brunswick, August 6, 1909, *Fernald*, no. 2069.

As I see the species, *Fraxinus pennsylvanica* Marshall consists of three rather pronounced varieties. As already explained (p. 450), I take as var. *typica* the tree which abounds in the region best known to Marshall, the extreme with pubescent young branchlets, petioles and leaf-rachises and with fulvous pubescence on the lower surfaces of the commonly entire leaflets; the fruits the longest in the species, with elongate and slender body and narrow wings (FIGS. 3 and 4). This tree is common southward, from Alabama to Louisiana, extending northward to central Maine, the Connecticut Valley of New Hamp-

shire and Vermont, the Champlain Valley of Vermont, central New York, southern Ontario, Michigan, Wisconsin and Minnesota. Var. *Austini*, which was sent to Asa Gray as an undescribed variety by the late Coe F. Austin (1831–1880), from Closter, New Jersey, is generally more northern. Var. *lanceolata* (Borkh.) Sargent, with branchlets, petioles and usually the serrate leaflets glabrous, is wide-ranging. *F. campestris* Britton, No. Am. Trees, 799, fig. 726 (1908), with "young twigs . . . either smooth or velvety" and toothed leaflets "more or less hairy beneath, rarely smooth on both surfaces," seems to me to be *F. pennsylvanica*, var. *lanceolata* passing into var. *Austini*.

My arrangement of the varieties of *Fraxinus pennsylvanica* follows:

Young branchlets velvety-tomentose; petioles, leaf-rachises and lower surfaces of leaves more or less fulvous-pubescent.
  Mature samaras 4–7.5 cm. long, the body (covering seed) 1.7–3 cm. long, the linear-oblanceolate wing 3–6 (rarely –7.5) mm. broad; leaflets usually entire or merely undulate, rarely dentate . . . . . Var. *typica*.
  Mature samaras 2.8–3.7 (rarely –4) cm. long, the body 1–1.7 cm. long, the spatulate wing 4–8 mm. broad; leaflets commonly toothed . . . . . Var. *Austini*.
Young branchlets, petioles and leaf-rachises glabrous; leaflets toothed, green and glabrous or at most with pale villosity on the principal nerves beneath; mature samaras 2.7–4.5 cm. long, their bodies 1–2 cm. long, the spatulate or oblanceolate wings 4–6 mm. broad . . . . . Var. *lanceolata*.

F. pennsylvanica Marsh., var. **typica**. *F. pennsylvanica* Marsh. Arbust. Am. 51 (1785). *F. Darlingtoniana* Britton, Man. 725 (1901) and No. Am. Trees, 802, fig. 730 (1908).—Alabama to Louisiana, north to warm valleys of New England, New York, southern Ontario, Michigan, Wisconsin and Minnesota. Plate 529, figs. 3 and 4.

Var. Austini. See above.

Var. lanceolata (Borkh.) Sargent, Sylva, vi. 50 (1894). *F. lanceolata* Borkh. Handb. Forst. Bot. i. 826 (1800).—Quebec to Saskatchewan and Montana, south to Virginia, Alabama, Arkansas, Oklahoma and Texas.

As already sufficiently emphasized many names, both specific and varietal, may belong to these three varieties. Until their bases are most painstakingly checked their application cannot safely be guessed at. Too much guessing in the past has created a confusion altogether not creditable. Under var. *lanceolata*, for instance, Sargent, in making the combination, cited three earlier varietal names which have to be considered. Any one of them, if belonging here, would upset the combination *F. pennsylvanica*, var. *lanceolata* (Borkh.) Sargent.

In southeastern Virginia Fraxinus pennsylvanica follows the James at least to Surry County: Claremont Wharf, no. 8412.

Obolaria virginica L. To the few recorded stations add the following. Isle of Wight County: rich deciduous woods north of Walters, no. 7145. Surry County: rich wooded slope at head of Sunken Meadow Creek, south of Claremont, no. 7951. Gloucester County: rich wooded bank, near Gloucester, *E. J. Palmer*, no. 39,773. See pp. 364, 375.

Asclepias purpurascens L. Rare on the Coastal Plain. Nansemond County: roadside thicket west of Cypress Chapel, no. 7579.

*Acerates floridana (Lam.) Hitchc. Sussex County: border of peaty and argillaceous swale, north of Littleton, no. 8422. See p. 378.

The first in the Gray Herbarium from north of South Carolina; known from a single station in Delaware.

*Ipomoea lacunosa L., forma **purpurata**, forma nov., corollis purpureis.—Virginia: grassy roadside about 7 miles south of Franklin, Southampton County, September 8, 1937, *Fernald & Long*, no. 7580; wet thicket bordering Whiteoak Swamp, south of Elko Station, Henrico County, September 21, 1938, no. 9409.

A form with the flowers consistently claret-purple instead of the usual milk-white.

Phlox nivalis Lodd. Southampton County: dry sand, pine barrens 6 to 7 miles south of Franklin, nos. 7146, 7583, 7952. Greensville County: border of dry rich woods near Metcalf Branch, east of Emporia, no. 7953. See pp. 364, 366.

At the latter station broadening of the road has reduced what presumably was a good colony to about 6 struggling survivors.

P. carolina L., var. triflora (Michx.) Wherry. Dinwiddie County: border of swampy woods, Poplar Grove (= Poplar Spring) Church, no. 8432; border of swampy woods east of Burgess, no. 8433. See p. 381.

The stations, discovered by *Meade Lewis*, who took us to them, are rather extensive. The plants are the narrow-leaved extreme but they have calyx-lobes mostly 7–9 mm. long, this agreeing with var. *triflora* which Wherry, Bartonia, no. 13:32 and 36, treats as a plant of the upland of North Carolina, Virginia and Maryland, thence to southern Indiana. Our stations are on the inner margin of the Coastal Plain.

Nemophila microcalyx (Nutt.) Fisch. & Meyer. Surry County: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7954. See p. 375.

Photo. H. G. Fernald.

FRAXINUS PENNSYLVANICA: FIG. 3, fruit from Massachusetts; FIG. 4, fruit from Pennsylvania.

Var. AUSTINI: FIG. 1, portion of TYPE, from New Brunswick; FIG. 2, fruit from New Jersey (*Austin*).

Photo. H. G. Fernald.

PLANTAGO VIRGINICA: FIG. 1, leaves and scapes, × 1; FIG. 2, upper surface of leaf, × 5; FIG. 3, base of spike, × 5.

Var. VIRIDESCENS: FIG. 4, TYPE, × 1; FIG. 5, upper surface of leaf, × 5; FIG. 6, base of spike, × 5.

The old specimen from Virginia, in the Gray Herbarium, is of vague origin.

PHACELIA DUBIA (L.) Trel. Our only Coastal Plain station in GREENSVILLE COUNTY: bottomland woods by Metcalf Branch, east of Emporia, no. 7955. See p. 374.

*MYOSOTIS VERSICOLOR (Pers.) Sm. DINWIDDIE COUNTY: in and about a newly seeded clover-field southwest of Petersburg, no. 7956.

*VERBENA BRASILIENSIS Vellozo. WARWICK COUNTY: fields and roadsides, Morrison, no. 7585. See p. 371.

A tropical species, recorded by Dr. Perry, *Revis. N. Am. Sp. Verbena*, Ann. Mo. Bot. Gard. xx. 255 (1933), northward to Wilmington, North Carolina.

V. URTICIFOLIA L. The coarse, typical form of the species, local on the Coastal Plain. YORK COUNTY: border of salt marsh northwest of Yorktown, no. 7586.

TEUCRIUM CANADENSE L., var. VIRGINICUM (L.) Eaton. See Fernald, RHODORA, XXXV. 395 (1933). Extending down the James to SURRY COUNTY: rich alluvial woods and thicket back of sand-beach of James River, Claremont Wharf, no. 8435. See p. 382.

TRICHOSTEMA DICHOTOMUM L., var. PUBERULUM Fernald & Griscom in RHODORA, XXXIX. 445 (1937). To the single Virginian station (in Norfolk County) reported add one from SOUTHAMPTON COUNTY: dry sand, pine barrens about 7 miles south of Franklin, no. 7591. See p. 366.

SCUTELLARIA VERSICOLOR Nutt. Extending locally eastward to SURRY COUNTY: rich calcareous wooded gullies by James River, Claremont Wharf, no. 8436; rich alluvial woods and thicket back of sand-beach of James River, below Sunken Meadow Beach, no. 8437. See pp. 382, 383.

*SCUTELLARIA INTEGRIFOLIA L., forma **rhodantha**, f. nov., corollis roseatis.—Damp thicket by roadside, west of Sussex Court House, VIRGINIA, June 9, 1938, *Fernald & Long*, no. 8440 (TYPE in Gray Herb., ISOTYPE in Herb. Phil. Acad.).

An unusually attractive color-form, making a conspicuous display, with flowers in color suggesting *Physostegia*.

AGASTACHE NEPETOIDES (L.) Ktze. Locally eastward to SURRY COUNTY: rich alluvial woods and thicket back of sand-beach of James River, below Sunken Meadow Beach, no. 8443. See p. 383.

PHYSOSTEGIA DENTICULATA (Ait.) Britton. Eastward to NANSEMOND COUNTY: wooded bottomland of Somerton Creek, Factory Hill, no. 8444.

STACHYS NUTTALLII Shuttlew. SURRY COUNTY: rich alluvial woods and thickets back of sand-beach of James River, below Sunken Meadow Beach, no. 8446. See p. 382.

COLLINSONIA CANADENSIS L. Eastward to SUFFOLK COUNTY: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8449; seen in similar habitat at Eastover. See p. 382.

*PHYSALIS MONTICOLA C. Mohr. SOUTHAMPTON COUNTY: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, nos. 8452, 8905.

First except from the mountains of Alabama. See p. 380.

SCROPHULARIA LANCEOLATA Pursh. SUSSEX COUNTY: rich wooded slope, 4 miles south of Stony Creek, no. 8454. See p. 381.

Extension into the edge of the Coastal Plain; Pennell (Scroph. E. Temp. N. Am. 278–280) noting stations only in the upland districts.

PEDICULARIS CANADENSIS L. Locally eastward to NANSEMOND COUNTY.

SCHWALBEA AMERICANA L. To the stations already noted add the following. SUSSEX COUNTY: dry open sandy pine and oak thickets, near the Greensville County line, south of Jarratt, no. 8461. GREENSVILLE COUNTY: similar habitat, near the Sussex County line, north of Emporia, no. 8462. Really one area, situated in two counties. See pp. 378, 379.

UTRICULARIA GEMINISCAPA Benj. Inland to DINWIDDIE COUNTY: peaty spring-fed pond, Century House, northeast of Burgess, no. 7612.

CONOPHOLIS AMERICANA (L. f.) Wallr. SURRY COUNTY: rich wooded gullies along James River, below Sunken Meadow Beach, no. 8464; seen also at Eastover. See p. 382.

*PLANTAGO VIRGINICA L., var. **viridescens**, var. nov. (TAB. 530, FIG. 4–6), foliis oblanceolatis 0.5–10 cm. longis 0.2–2 cm. latis repando-dentatis vel integris supra glabris vel sparse hirsutis glabratisque; pedunculis 1–12 cm. longis piloso-hispidis, pilis 0.2–0.5 mm. longis; spicis 0.3–13 cm. longis; sepalis 1.5–2.3 mm. longis; corollae lobis 1–2.5 mm. longis; seminibus 1.2–1.5 mm. longis.—Maryland to Florida, west, locally, to Texas. MARYLAND: border of pasture-meadow, about 1 mile southeast of Rock Springs, Cecil County, May 3, 1925, *Long*, no. 32,312; field, Owing's Mills, Baltimore, May 3, 1910, *J. R. Churchill.* VIRGINIA: dry fields, campus of University of Richmond, Westhampton, April 24, 1935, *Alice Ryland;* argillaceous and siliceous cotton field south of Littleton, April 4, 1938, *Fernald & Long*, no. 7964; sandy roadside-bank near Hart's Bridge, southwest of Sunbeam, April 4, 1938, *Fernald & Long*, no. 7965 (transitional); bare sand near Walters, April 6, 1938, *Fernald & Long*, no. 7966 (TYPE in Gray Herb; ISOTYPE in Herb. Phil. Acad.). NORTH CAROLINA: hard clayey soil by roadside, 5 miles south of New Bern, April 15, 1932, *Weatherby*, no. 6089. SOUTH CAROLINA: dry pine woods south of Myrtle Beach, April 8, 1932, *Weatherby & Griscom*, no. 16,642; loose sand, roadside, 1 mile north of Georgetown Landing, April 20, 1932, *Griscom & Weatherby*, no. 16,640; sandy soil by ditches, Sum-

merville, April 11, 1912, *Robinson*, no. 130. GEORGIA: old specimen without further data (Herb. *Geo. Thurber*); Augusta, *Olney & Metcalf*, no. 253. FLORIDA: weed in cultivated ground, Duval County, April 2, 1902, *Fredholm*, no. 5019; sandy soil, Eustis, April 1–15, 1894, *Nash*, no. 344; waste ground, Hillsborough County, March 5, 1904, *Fredholm*, no. 6305; Apalachicola, April, 1875, *A. Gray;* Hibernia, March, 1869, *Canby*. TEXAS: Houston, March 23, 1900, *Canby*, no. 206.

In southeastern Virginia, in early April, 1938, var. *viridescens* was in full anthesis and, at the type station, in fruit, whereas typical and ubiquitous *Plantago virginica* was not yet flowering (see p. 373), though on the 9th the first flowers were coming out. Not only the early flowering, the small flowers (FIGS. 4 and 6) and the green, soon glabrate leaves strongly contrast with typical *P. virginica*. The leaves are consistently narrow, their pubescence (FIG. 5) short, and the pubescence of the peduncle (FIG. 6) short and relatively stiff. Typical *P. virginica* varies in size, of course, but it is usually much larger than var. *viridescens*. It has a grayish-green tone on account of the villous young leaves and peduncle, whence a colloquial name, "Hoary Plantain." Its leaves (FIG. 1) are narrowly obovate and rather permanently villous, the hairs (FIG. 2) much longer than in var. *viridescens*. Its peduncles are copiously villous with flexuous hairs (FIG. 3) 1–2 mm. long (except in starved individuals); its sepals are 2–2.5 mm. long, corolla-lobes (FIG. 3) 2–3 mm. long and seeds 1.6–2 mm. long.

It is possible that var. *viridescens* may have been described by Rafinesque as a species. I have been unable to derive clear satisfaction from his diagnoses; and for a variety the present name is appropriate and rests on cited specimens. In his recent treatment of *Plantago virginica* Pilger recognizes[1] only two varieties: var. *longifolia* Gray, which is all really *P. rhodosperma* Decne., as shown by the sheets labeled by Gray; and var. *progressa* Pilger, a very densely villous extreme from Mexico. *P. purpurascens* Nutt., as shown by his material at the Academy of Natural Sciences of Philadelphia, is typical *P. virginica*.

P. HETEROPHYLLA Nutt. Local weed of cultivated fields. SOUTHAMPTON COUNTY: north of Sebrell, no. 7968. GREENSVILLE COUNTY: 1 mile south of Emporia, no. 7154. See pp. 364, 372, 373.

GALIUM UNIFLORUM Michx. Range extended to the Peninsula of Virginia and, later, to the Gloucester Peninsula. YORK COUNTY: dry open woods northwest of Tabb's, no. 7619. GLOUCESTER COUNTY: rich mixed woods east of Gloucester, no. 8857. See p. 371.

[1] Pilger in Engler, Pflanzenr. iv[269]. 213, 214 (1937).

Diodia teres Walt., var. hystricina Fernald & Griscom. Range extended westward to York County: sandy beach of York River, northwest of Yorktown, no. 7620. See p. 372.

Cephalanthus occidentalis L., var. pubescens Raf. Prince George County: swampy woods, bottomland of Powell's Creek, Garysville, no. 8477. Greensville County: shallow pond-hole in woods, just north of Dahlia, no. 8858.

Houstonia patens Ell. Extending into the inner border of the Coastal Plain. Greensville County: dry rich woods, about 1 mile west of Emporia, no. 7970. Southampton County: sandy roadside bank near Hart's Bridge, no. 7969.

H. longifolia Gaertn. Locally along the James to Surry County: rich wooded gullies below Sunken Meadow Beach, no. 8482. See p. 382.

Oldenlandia Boscii (DC.) Chapm. To the first Virginian station, already reported add, also in Southampton County: wet siliceous and argillaceous drained border of Predler's Pond, Nottoway Swamp, southwest of Sedley, no. 7625; border of peaty pool in cypress-gum swamp, about 4 miles northwest of Capron, no. 7626. See p. 364.

Viburnum acerifolium L. Surry County: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8484. See p. 382.

Our only Coastal Plain station.

Eupatorium fistulosum Barratt acc. to Wiegand & Weatherby in Rhodora, xxxix. 306 (*E. purpureum* and *E. trifoliatum* sensu Wiegand in Rhodora, xxii. 161, not L.). Sussex County: alluvial woods, Coppahaunk Swamp, about 3 miles southeast of Waverly, no. 7637.

Cited by Wiegand, l. c. only from the region of the Blue Ridge in Virginia.

E. purpureum L., acc. to Wiegand & Weatherby, l. c. (*E. trifoliatum* L.; *E. falcatum* Michx.). Surry County: rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8488; seen also at Eastover. Nansemond County: rich deciduous wooded slope, South Quay, no. 8489. See p. 382.

The freshly dried plant has a strong fragrance of vanilla.

Carphephorus bellidifolius (Michx.) T. & G. To the first Virginian stations (in Isle of Wight County), already recorded, add one in Southampton County: dry sand, pine barrens about 7 miles south of Franklin, no. 7659. Nansemond County: dry woods east of South Quay, no. 9173. Greensville County: pine woods west of Skipper's, no. 8870. See p. 366.

Plant glutinous, staining the papers yellow.

C. tomentosus (Michx.) T. & G. To the only known Virginian station (in Isle of Wight County) add the following. Southampton County: clearing in wet argillaceous pineland northeast of Courtland,

no. 7655. NANSEMOND COUNTY: low pinelands east of Whaleyville, nos. 7656, 7657 (7.5 dm. high, with about 40 heads in larger plants); sandy roadside thicket bordering pine woods, south of Piney Grove School, northwest of Whaleyville, no. 7658, very abundant and handsome, with corymbs up to 2 dm. across. GREENSVILLE COUNTY: sphagnous bog about 1 mile northwest of Dahlia, nos. 8869, 9172. See pp. 367, 370.

LIATRIS SPICATA (L.) Willd. SUSSEX COUNTY: moist pinelands just southeast of Waverly, no. 7660, very abundant.

As pointed out on p. 366, *Liatris spicata* in Virginia and the Carolinas is chiefly montane.

(*To be continued*)

MISCELLANEOUS NOTES ON UNITED STATES PLANTS

ROBERT F. MARTIN

Among the plants on the desk of the late Doctor F. V. Coville at the time of his death was a *Juncus* collected in the La Sal National Forest, southeastern Utah, *R. E. Mellenthin 3*, 20 June, 1912, tentatively determined as *J. interior* Wiegand. A check against authentic material of this species in the National Herbarium supports this identification and establishes a record for this species in Utah. The specimen is in the herbarium of the Forest Service, no. 4987.

Last year a fresh specimen of *Solanum rostratum* Dunal was transmitted for determination to the Bureau of Plant Industry by Mr. J. Parish, Agricultural Agent, Grand County, Utah. I think this is the first record of the plant in Utah, at any rate it is not included in Tidestrom's Flora. The specimen was collected at Moab in the county mentioned, where Mr. Parish observed, "It is getting pretty common."

Although described from Texas near the New Mexico line, *Selenia dissecta* Torr. appears not to have been reported from the latter state. It is represented in the herbarium of the National Arboretum by *M. W. Talbot 921*, collected along a roadside near Capitan, Lincoln County, 12 April, 1929.

On 14 July, 1934, I found a growth of *Festuca myuros* L. in a roadside ditch half way up the Blue Ridge near Charles Town, Jefferson County, West Virginia. This species has not been reported from West Virginia. The specimen, my *207*, is in the herbarium of West Virginia University.

I have determined as *Carex Bushii* Mackenzie a plant collected by *Wilbert Frye*, 20 May, 1935, Okonoko, Hampshire County, West Virginia. Mackenzie, while listing bordering states, made no mention of West Virginia material in his treatment in North American Flora, and I offer this as a first record. The specimen is in the herbarium of the National Arboretum.

Juncus brachycephalus (Engelm.) Buch., forma **hexandrus**, f. n., a forma typica staminibus 6 differt.

Type in the herbarium of West Virginia University, collected on low, sandy marl border of the east side of Cedar Lake, Lagrange County, Indiana, 19 Sept., 1933, *Chas. C. Deam 54539A*. Also represented in the National Herbarium by *H. C. Beardslee*, Aug. 1890, Cheboygan County, Michigan, and by *F. V. Coville*, 23 Aug. 1886, Welland County, Ontario.

Since this peculiarity in otherwise typical material of *J. brachycephalus* causes it to key out in our manuals to *J. caesariensis* Coville (*J. asper* Engelm., not Sauzé), an entirely different plant known only from southern New Jersey and southeastern Virginia, it seems well to give it formal recognition. To one lacking herbarium material of *J. caesariensis* the confusion would probably be accentuated by a tendency of the lower leaves of the present form (as well as the species) to become minutely scabrous. This roughness is much less pronounced than in *J. caesariensis*. The latter species is also at once distinct by its narrower inflorescence and larger perianth-segments, about 4.5 mm. in length, those of the present plant being only 2–2.5 mm. long. The seeds, too, are very different; in *J. caesariensis* they are long-tailed at either end and have a total length of 2 mm., while those of *J. brachycephalus* and its form are .7–1 mm. long. The caudate seeds of the present form will distinguish it from *J. articulatus* L., in case of its being sought under that species.

Callirhoë involucrata (T. & G.) Gray, var. **Bushii** (Fernald), comb. nov. *C. Bushii* Fernald, Rhodora **11**: 51. 1909.

Last year in starting a study of North American *Malveae*, I annotated all sheets of this as *C. involucrata*. I am now convinced that such treatment was more than conservative, and feel that this plant from southern Missouri and northern Arkansas can be well treated as a variety. Its intergrades and absence of good floral or carpellary characters restrain me from conserving its specific status. I am now naming *Callirhoë* as follows:

Calyx subtended by an involucre.

Peduncles several-flowered; leaves mostly simple, triangular
C. triangulata (Leavenw.) Gray.

Peduncles 1-flowered; leaves lobed, divided or dissected.

Annual; stem simple, erect; leaves 5-lobed or divided; lateral walls of carpel very thin.....*C. scabriuscula* Robinson.

Perennial from a thickened, often tuberous tap-root; lateral walls of carpel firm.

Primary divisions of the leaves mostly entire; pubescence generally appressed.....*C. Papaver* (Cav.) Gray.

Primary divisions of the leaves toothed to dissected; pubescence in part spreading.

Leaves divided nearly to the base, the segments lanceolate to linear; plant procumbent....*C. involucrata* (T. & G.) Gray.

Leaves lobed, the segments broader; plant erect or ascending.....*C. involucrata* var. *Bushii* (Fernald) Martin.

Calyx not subtended by an involucre.

Perennial from a thickened tap-root; carpels rugose-reticulate on the back.

Calyx and carpels (at least on top) plainly strigose-pubescent
C. alcaeoides (Michx.) Gray.

Calyx and carpels glabrous or essentially so.....*C. digitata* Nutt.

Annual; carpels nearly smooth on the back.....*C. leiocarpa* Martin. (*C. pedata* Gray, p. p., not *Nuttallia pedata* Nutt. ex Hook.)

Division of Plant Exploration and Introduction,
Bureau of Plant Industry, Washington.

Another New Hampshire Station for Rhododendron maximum.—On July 16, 1928, accompanied by my wife and Mrs. T. L. Storer as guide, I visited a native colony of *Rhododendron maximum* L. at Adams Pond in the extreme southwest corner of Strafford, New Hampshire. It has long been known to some of the farmers of the vicinity, but apparently never before reported in this journal nor represented by a specimen in the Herbarium of the New England Botanical Club.

The colony consists of many seedlings and numerous older plants, reaching a maximum height of 3–4 meters. They may be found scattered along the southeast shore for a distance of about 200 meters. Judging from the town boundaries, as plotted on the U. S. Geological Survey map, some of the plants are in Strafford, but the main colony is in Pittsfield. Although easily accessible, there was little or no evidence of destruction by thoughtless gardeners. A few late blooms were still persisting at the time of our visit.—R. J. Eaton, Cambridge, Mass.

NOTES ON SOME MAINE PLANTS

Anne E. Perkins

Ophioglossum vulgatum L. Well distributed on the main land, at least south of the 45° of latitude, is common about Penobscot Bay. I have collected it on Spectacle Island of the town of Brooksville; on Eagle, Pond and Hog Islands in the town of Deer Isle. It has been collected on Deer Isle, and on North Haven by *A. H. Norton*. I have also collected it at Lee, Penobscot County.

Lophotocarpus calycinus var. spongiosus (Engelm.) Fassett. York, abundant on muddy shores of Smelt Creek, where noticed by *Oliver Neal, Jr.* July, 1936.

Bromus Kalmii Gray. Collected in Baldwin, Cumberland County, July 28, 1933.

Except Weatherby's locality in Oxford (Rhodora, **17**: 71) the species seems unrecorded from this state.

Hemicarpha micrantha (Vahl) Britton. A good station on the shore of Province Lake, Parsonsfield.

Hypoxis hirsuta (L.) Coville. Noticed by *Oliver Neal* by a roadside in South Berwick (Emery's Bridge) in June, 1936. There were four blooming plants. A specimen is in the Portland Nat. Hist. Museum.

Sisyrinchium mucronatum Michx. Flowering freely in a small area, in Wells, June, 1937 (*Norton, Perkins and Haven*).

It was previously known in Maine only from Winn (1935, Rhodora **37**: 75). During the meeting of the Josselyn Botanical Society in 1937, it was found to be the common blue-eyed grass in the towns of Lee and Springfield, Penobscot County, in the region of Winn, growing abundantly in sandy fields and roadsides.

Arenaria peploides var. robusta Fernald. Known from Wells for half a century; found to be still flourishing at Drake's Island, Wells, in July, 1936.

Benzoin aestivale (L.) Nees. Found by the Saco River in Hollis, at the eastern boundary of York County, June 15, 1938.

It has not, I believe, been previously found east of North Berwick, about 25 miles to the southeastward. About 45 years ago *J. C. Parlin* found it in North Berwick (station lost) and in July, 1934, I found it abundantly in Eliot.

Baptisia tinctoria (L.) R. Br. At the meeting of the Josselyn Botanical Society in 1936 this was found in considerable quantity at the eastern slope of Yeaton Hill, by the roadside west of Shaker Pond, Alfred. It was also found on the east side of that Pond, on Shaker Hill, on grounds now occupied by the Notre Dame Institute.

ZANTHOXYLUM AMERICANUM Mill. Plentifully scattered through the grounds of the Shaker settlement at Shaker Hill, Alfred, now occupied by Notre Dame Institute.

Shakers settled at this place as early as 1782, and it is probable that the plant was introduced by these herbalists at an early date. The eminent Dr. George L. Goodale, a native of York County, during his preparatory years served as "an Apothecaries, assistant, and acquired a good knowledge of the pharmacy of that day." With every opportunity to become familiar with the medicinal plants of the Shaker vendors, he entered this species in his catalogue of Maine Plants in 1862, without comment. It was carried forward by Dr. Fernald in his Catalogue of 1892, though in his supplement to that catalogue in 1895 he removed it to his list of species having no known station in the state, and here it has remained until the present.

EUPHORBIA COROLLATA L. On August 7, 1938 I found a lusty clump of this species in York in a pasture by an obscure road east of Mount Agamenticus. It was far from any occupied dwelling.

EMPETRUM NIGRUM L. This boreal plant, now known to occur westerly along the headlands and outer Islands of the Maine coast to Casco Bay, I am now able to record from stations well up into Penobscot Bay: Eagle Island, freely; Pickering's Island, abundantly; and on Beach Island.

LILAEOPSIS LINEATA (Michx.) Greene. In great abundance on the shores of the estuary at South Berwick; 1936.

CORNUS FLORIDA L. Through a casual remark of a forest ranger, I have had the great satisfaction of collecting the flowering dogwood from two small stations on Mount Agamenticus in the town of York in 1936 and 1937.

This species was entered without comment in Dr. Goodale's catalogue of 1862, and has been considered an element of the Maine flora since. Prof. Fay Hyland, in his search for woody plants, has been unable to locate a preserved specimen or to find a station, hence the discovery of the plant is very gratifying.

PENSTEMON PALLIDUS Small. This plant, which I have known to occur in Wells and South Berwick for fifty years, has spread quite widely during that period, now being established in Eliot, Berwick, South Berwick, Wells, North Berwick and Sanford.

PENSTEMON DIGITALIS Sweet. Apparently established on Butter Island, Penobscot Bay, where I found about a dozen plants in 1936 and again 1937.

VERONICA AGRESTIS L. I found a sizable and vigorous colony of this speedwell at Castine in 1936.

Conopholis americana (L. f.) Wallr. A small colony found in the vicinity of Ross Corner, Shapleigh by *Oliver Neal, Jr.* in July, 1937.

It was previously known in York County from Parsonsfield (1902, Rhodora **4**: 169).

Bidens Beckii Torr. In Masabeesic Lake ("Shaker Pond"), Alfred, dense mats obstructing the passage of our boat, 1936.

Berwick, Maine

Nomenclature at the next International Congress.—On behalf of the VIIth International Botanical Congress I ask you to insert the following notice in the next number of your periodical:

Motions dealing with Nomenclature for consideration by the VIIth International Botanical Congress, Stockholm 1940, should be sent before July 1, 1939, to the *Rapporteur général*, Dr. T. A. Sprague, The Herbarium, Royal Botanic Gardens, Kew, Surrey, England.

Motions must be presented in the form of additional articles or amendments to the International Rules. They should be drafted as briefly as possible. At least 100 printed copies must be presented.—J. A. Nannfeldt, *Recorder*, Section for Taxonomy and Nomenclature, Botaniska Institutionen, Uppsala, Sweden.

Volume 40, no. 478, including pages 361–424 and plates 508–520, was issued 15 October, 1938.

DEC 27 1938

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 40. December, 1938. No. 480.

CONTENTS:

Additional Notes on the Valerianellas of North America. *Sarah C. Dyal* 465

Noteworthy Plants of Southeastern Virginia (concluded). *M. L. Fernald* 467

Trillium erectum, var. blandum, var. nov. *H. M. Jennison* 485

Persistence of Opuntia humifusa in Concord, Massachusetts. *R. J. Eaton* 486

Tomentose Form of Cladrastis lutea. *Julian A. Steyermark* 487

Coldenia Nuttallii in Missouri. *Julian A. Steyermark* 487

Errata 488

Index to Volume 40 489

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at $22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

No. II. Persistence of Plants in Unglaciated Areas of Boreal America, by M. L. Fernald. 103 pp., 73 maps. 1925. $3.00.

No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. $3.00.

Gray Herbarium of Harvard University, Cambridge, Mass.

H pl. 531-36

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 40. **December, 1938.** **No. 480.**

ADDITIONAL NOTES ON THE VALERIANELLAS OF NORTH AMERICA

Sarah C. Dyal

In the May issue of Rhodora for 1938 was published a monographic treatment of the Valerianellas of North America, containing five new species and three new varieties. The description of one of those new species, *V. texana*, was based on only four individual plants collected during the latter part of the nineteenth century by Gustav Jermy at "Kini Creek" in Gillespie County, Texas. On March 29, 1938, through the kindness of Mr. H. B. Parks of San Antonio, Texas and Mr. F. B. Riley of Fredericksburg, Texas, the type station of this new species was located. Now some eighty individual plants are in the possession of the writer for study and distribution. The description as given in the monographic treatment still holds after the study of this material and the species remains distinct.

Some difficulty was experienced in locating "Kini Creek." The name is apparently a local one given, perhaps, by the Indians to a creek three and one half miles southeast of the Enchanted Rock that flows through a ranch once owned by a Mr. Kiehne, a bachelor, who is said to have befriended them. Three separate trips were made to Texas before this information was obtained. As stated in the monograph, no one seemed to know of a creek by that name and there was no mention of such a name in the county courthouse records. It was Mr. H. B. Parks who finally told the writer where the Kiehne Country was and said that possibly a creek flowing through the "Ben" Riley ranch might be the one intended. Accordingly, Mr. Riley, whose family has owned a ranch near the Enchanted Rock for over one

hundred years, was visited, only to discover that this creek was not "Kini Creek" but "Crabapple Creek." However, Mr. Riley knew "Kini Creek" and arrangements were made to explore it the following morning. In the meantime all of the likely places on his ranch and those along the road to "Kini Creek" were searched in vain. In order to lessen the disappointment if the plants were not found, Mr. Riley kept repeating after each futile search, "I would not have too much hope of finding that plant, since all of this country through here has been grazed by sheep, goats, and cattle for many years." This coming after Mr. Parks had previously said, "Sheep will go through three fences to get Valerianella," was, indeed, not too encouraging. At last "Kini Creek" was reached and forded, for there was no bridge, and but little time was lost in parking the car. It was with a peculiar feeling of mingled hope and fear that the writer stepped from the car to begin a final search for this rare Valerianella. Those fears soon gave way to joy, however, for only twenty feet from the car a few tiny plants of Valerianella appeared which, after a hasty examination, were discovered to be the long sought species. Mr. Riley was about as surprised as the finder was pleased for these plants were almost too small for him to see. Further search yielded more plants, some much larger, though they were not abundant. That was a very successful day. Mr. Riley, who is a prospector, said that he often had other prospectors come to him for assistance but that the writer was the first to go away satisfied.

The Enchanted Rock, where "Kini Creek" and "Crabapple Creek" have their origin, is a granite mass protruding from the limestone of the Edwards Plateau. The soil of that immediate region is therefore decomposed granite. That is why, perhaps, this new species is restricted to that region. It was collected on "Kini Creek" and also, though in less abundance, on "Crabapple Creek" about two tenths of a mile farther east. There were a few plants of *V. amarella* growing on "Crabapple Creek" with *V. texana* but the plants of the latter species were easily recognized at a distance by their more slender appearance and loose corymbose cyme.

V. carinata, an introduced species, reported in the monograph only from Oregon, was collected in May 1938 in the Sierra foothills east of Jackson, California where it apparently had become naturalized. Later Miss Ethel K. Crum, assistant curator of the Herbarium of the University of California, went to that locality to collect a set of fifty

sheets for distribution. When the writer examined this material about one third of it was found to be *V. carinata* and the remaining two thirds were *V. olitoria*, another introduced species. The plants of *V. carinata* were in the advanced fruiting stage while those of *V. olitoria* were in the early flowering stage. The two species were growing there together but *V. carinata* was about two or three weeks earlier than *V. olitoria*.

Cornell University,
Ithaca, New York

NOTEWORTHY PLANTS OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from page 459*)

*Chrysopsis **Longii**, sp. nov. (tab. 531, fig. 1–4), planta *C. gossypinam* simulans valde sericeo-lanata, villis albidis; caulibus 1–10 4.5–7.5 dm. altis basi decumbentibus supra ramosis ramis divergentibus vel adscendentibus; foliis basilaribus rosulatis oblanceolatis 3–7 cm. longis 0.5–1.7 cm. latis; foliis caulinis numerosis, imis anguste obovatis vel oblongo-oblanceolatis 3–6 cm. longis 1–2.3 cm. latis, foliis mediis superioribusque oblongis leviter reductis, foliis ramorum similibus minoribus subremotis; involucro late hemispherico-campanulato 1–1.5 cm. alto valde albido-lanato; bracteis 5–6-seriatis lineari-lanceolatis apice attenuatis, apicibus deinde squarrosis; ligulis 25–30, 1–1.3 cm. longis; disci floribus numerosis (100–200), 6–8 mm. longis, fauce lobisque longe villosis; achaeniis oblanceolatis stipitatis 2.8–3.4 mm. longis 0.8–1.2 mm. latis dense sericeo-strigosis, pilis albidis; pappo ochroleuco 6–8 mm. longo.—Southampton County, Virginia: dry sand, pine barrens about 7 miles south of Franklin, September 7 and 8, 1937, *Fernald & Long*, no. 7664 (type in Gray Herb., isotype in Herb. Phil. Acad.), October 12, 1937, *Braxton Townsend*, no. 7725 (topotype, distributed to many herbaria); sandy thickets and open woods near Blackwater River, north of Smith's Ferry, back of Bailey's Seine Beach, July 19, 1938, *Fernald & Long*, no. 8874; dry sandy old clearing, north of Smith's Ferry, Nottoway River, *Fernald & Long*, no. 8875.

Chrysopsis Longii is apparently the plant which has passed as *C. gossypina* (Michx.) Nutt. in southeastern Virginia (see p. 366). I have seen no earlier-collected material identified as *C. gossypina* and Small (Man.) doubts the extension northward into Virginia of that species (*C. pilosa* (Walt.) Britton). However, our original station for it is

in the dry sandy pine barren through which the old and now abandoned road southward toward Murfreesboro, North Carolina, used to run; in fact, the plant abounds and spreads[1] in the loose sand of the abandoned roadway. In 1867 the late Wm. M. Canby collected near Franklin *Baptisia villosa* (Walt.) Ell. and many other highly localized species (now in the Gray Herbarium) and he, as well as others before and after him, could hardly have missed so conspicuous a plant as *Chrysopsis Longii*.

Although so strongly resembling *Chrysopsis gossypina* that, upon discovering it, we took if for that more southern species, *C. Longii* differs from the plant occurring from southeastern North Carolina to Florida in several characters. In habit and foliage it is very similar but its leaves are relatively large. The involucre of *C. gossypina* (FIG. 5) has the bracts shorter, narrower, less inclined to be squarrose at tip and with the slender tips more implicated in wool; the broader and longer bracts of *C. Longii* (FIG. 2) soon become squarrose and their tips are mostly free or less inmeshed. The most fundamental characters, however, are in the disk-corollas and the mature achenes. The disk-corollas of *C. gossypina* (FIG. 6) are glabrous at summit, those of *C. Longii* (FIG. 3) have long villi or sparse beard at the throat and on the lobes. The ripe achenes of *C. gossypina* (FIG. 7) are cuneate-obovate, 2 mm. long and with a prominent blunt and smoothish rib down the middle of each of the sparsely pilose faces. The ripe achenes (FIG. 4) of *C. Longii* are narrower and longer (2.8–3.4 mm. long), copiously silky-strigose and with a very slender and obscure pilose midrib on each face.

A word should be said regarding the correct name of *Chrysopsis gossypina*. The species was first published as *Erigeron pilosum* Walt. Fl. Carol. 206 (1788). It was next described from "maritimis Carolinae et Floridae" as *Inula gossypina* Michx. Fl. Bor.-Am. ii. 122 (1803). In 1818 the species was transferred to *Chrysopsis* as *C. gossypina* (Michx.) Nutt. Gen. ii. 150 (1818), the correct name for the plant. In 1832 Nuttall described the well-known species of the interior of the United States as *C. pilosa* Nutt. Journ. Acad. Phila. vii. 66 (1834). But Britton, following the now discarded American Code, renamed *C. pilosa* Nutt. (1834) *C. Nuttallii* Britton in Mem. Torr. Bot. Cl. v. 316 (1894) because of the earlier *Erigeron pilosum*

[1] In July, 1938, the white-lanate plant was found to spread so vigorously in sandy clearings that I jocosely dubbed it "LONG'S FLANNELWEED."

Photo. E. C. Ogden.

Chrysopsis Longii: fig. 1, small plant, × ½; fig. 2, involucre, × 1; fig. 3, disk-corolla, × 7; fig. 4, achene, × 7.
C. gossypina: fig. 5, involucre, × 1; fig. 6, disk-corolla, × 7; fig. 7, achene, × 7.

Photo. E. C. Ogden.

SOLIDAGO PERLONGA: FIG. 1, plant, × $\frac{2}{5}$, from Virginia; FIG. 2, reticulation of leaf, × 10, from TYPE; FIG. 3, involucre, × 5; FIG. 4, achene, × 10.

S. AUSTRINA: FIG. 5, reticulation of leaf, × 10, from ISOTYPE; FIG. 6, involucre, × 5, from ISOTYPE; FIG. 7, achene, × 10, from ISOTYPE.

Walt. (1788); and he published the equally superfluous combination *C. pilosa* (Walt.) Britton, l. c. (1894) not Nutt. (1834) for the plant which is correctly *C. gossypina* (Michx.) Nutt.

SOLIDAGO ARGUTA Ait. Reaching the Coastal Plain in SUSSEX COUNTY: alluvial woods, terraces of Nottoway River, southwest of Burt and southwest of Lamb's, nos. 7666, 7667. GREENSVILLE COUNTY: rich woods by Fontaine Creek, west of Dahlia, noted but not collected. SURRY COUNTY: calcareous wooded slope by James River, Cobham Wharf, no. 9462. See p. 366.

*SOLIDAGO **perlonga**, sp. nov. (TAB. 532, FIG. 1–4), planta *S. austrinam* simulans; caule glabro plus minusve purpureo-maculato 0.9–1.5 m. alto; foliis subcoriaceis glaberrimis margine scabro exceptis conspicue punctatis, basilaribus laminis late oblanceolatis vel anguste ovato-lanceolatis acutis vel subacutis 0.7–2.5 dm. longis 1.5–8 cm. latis serratis vel crenatis basi attenuatis, costa dorso acute angulata, reticulo conspicuo, petiolis vix alatis eciliatis laminam aequantibus vel superantibus, foliis caulinis valde reductis imis elongatis mediis superioribusque lanceolatis integris vel subintegris acutis, reticulo conspicuo; inflorescentia valde elongata, anguste cylindrica interrupta 2–6.5 dm. alta simplici 2–5 cm. diametro ramulis secundis perbrevibus apice floriferis, vel ramosis ramis erectis vel adscendentibus valde elongatis; pedicellis glabris bracteolatis ad 1 cm. longis; involucris campanulatis 5.5–6.5 mm. longis; bracteis chartaceis 4–5-seriatis, exterioribus lanceolato-subulatis, interioribus oblongo-linearibus obtusis stramineis dorso viridibus; disci floribus 12, tubo 1–1.5 mm. longo, fauce 2–2.5 mm. longo, lobis 1 mm. longis; ligulis 5–7, 1.7–2 mm. latis; achaeniis maturis 1.4–1.8 mm. longis albido-strigosis; pappo maturo 4 mm. longo.—Southeastern VIRGINIA: wet woods, Westhampton, Henrico County, in young flower, September 9, 1937, *Fernald & Long*, nos. 7668 and 7669, in fruit October 13, 1937, *R. F. Smart;* clearing in wet argillaceous pineland northeast of Courtland, Southampton County, in young flower, September 11, 1937, *Fernald & Long*, no. 7670 (TYPE in Gray Herb., ISOTYPES in Herbs. Phil. Acad., Univ. Richmond and elsewhere); border of exsiccated argillaceous woods south of Brandon, Prince George County, August 16, 1938, *Fernald & Long*, nos. 9180–9183; border of field, west of Burrowsville, Prince George County, September 17, 1938, *Fernald & Long*, no. 9463; exsiccated swampy woods about 1 mile southwest of Branchville, Southampton County, August 19, 1938, *Fernald & Long*, no. 9184; exsiccated argillaceous pineland about 2 miles east of Stony Creek, Sussex County, August 24, 1938, *Fernald & Long*, no. 9185, also October 11 and 12, 1938, no. 9640. See p. 370.

Solidago perlonga, very striking on account of its slender and elongate inflorescence, simulates *S. austrina* Small, *S. flavovirens* Chapm. and *S. yadkinensis* (Porter) Small. Its quite glabrous in-

florescence, its elongating rhizomes and the slender eciliate petioles of its basal leaves quickly distinguish it from the last species. In its rhizome, eciliate petioles and glabrous inflorescence it is close to the two former and clearly belongs in the series designated by Mackenzie in Small's Manual the *Uliginosae*.[1] From *S. flavovirens* of the Apalachicola marshes it is at once separated by its slender petioles, mostly serrate lower blades and broad blunt involucral bracts. In general *S. perlonga* is nearest related to *S. austrina*. It is coarser throughout, except for the smaller achenes. Its conspicuously veiny leaves (FIG. 2) with greenish rather acutely angled midrib contrast with the minutely and inconspicuously reticulate leaves (FIG. 5) and the whitish wire-like midrib of *S. austrina*. In the latter the basal leaves have blades 0.7–1.5 dm. long and only 1–2.5 cm. broad; in the newly proposed species they are much larger (1–2.5 dm. long and up to 8 cm. broad). In *S. austrina* the involucre (FIG. 6) is 4–5 mm., in *S. perlonga* (FIG. 3) 5.5–6.5 mm. high and with broader bracts. The ligules of *S. austrina* are 1–1.5 mm., those of *S. perlonga* 1.7–2 mm. broad. The mature achenes of *S. austrina* (FIG. 7), as shown in the type collection, are 3–3.6.5 mm. long, those of the coarser *S. perlonga* (FIG. 4) are only 1.4–1.8 mm. long. In southeastern Virginia, where *S. perlonga* occurs in wet woods and peaty clearings, it was just beginning to flower on September 9th,[2] and mature material has been supplied by Dr. Smart, collected on October 13th. The type of *S. austrina*, in fully mature fruit, was collected September 11th and several sheets are before me in full anthesis collected in North Carolina in mid-August. In general species of *Solidago* flower earlier in the North than southward. It is probable that *S. perlonga* is a later-flowering plant than its nearest ally. As the type[3] of *S. perlonga* I have designated the plant of Southampton County, although we have a more diverse series from the Westhampton station. The latter colony, unfortunately, is in the midst of a rapidly changing suburban development and is destined soon to be destroyed. The type-station is in wild and, except for cutting of timber, undisturbed pineland between Courtland and Sedley.

[1] In his definition of the series Mackenzie explicitly says "blades . . . not pellucid-punctate." This, however, was an unfortunate statement, for in the herbarium-material of *S. flavovirens*, *S. austrina* and *S. perlonga* the pellucid dots are very definitely shown by holding the specimens in front of an ordinary desk-lamp.

[2] In 1938, *S. perlonga*, seen frequently in swampy or exsiccated borders of woods, began flowering in mid-August but was in its prime in mid-September.

[3] The TYPE was designated and isotypes distributed to other herbaria before the discovery in 1938 of several more extensive colonies.

S. GRAMINIFOLIA (L.) Salisb., var. POLYCEPHALA Fern. Inland to DINWIDDIE COUNTY: sphagnous boggy margin of spring-fed pond, Century House, northeast of Burgess, nos. 7674, 7675. See p. 368.

ERIGERON PULCHELLUS Michx. Eastward in rich woods and clearings to SURRY COUNTY.

E. PHILADELPHICUS L. SURRY COUNTY: calcareous meadow near head of Sunken Meadow Creek, south of Claremont, no. 7977.

Our only other Coastal Plain station is on Cedar Island in Back Bay, Princess Anne County.

E. VERNUS (L.) T. & G. Extended inland from the coast of Princess Anne County to western NANSEMOND COUNTY: springy thicket bordering ditch, north of Factory Hill, no. 8491. See p. 379.

*ANTENNARIA FALLAX Greene, var. CALOPHYLLA (Greene) Fernald (*A. ampla* Bush). DINWIDDIE COUNTY: dry sandy pine woods southeast of Burgess, no. 7691. PRINCE GEORGE COUNTY: dry woods northeast of Talpa, no. 8889.

First north of North Carolina.

*A. MUNDA Fernald in RHODORA, xxxviii. 229, t. 433 (1936). SURRY COUNTY: knoll at border of dry beech woods in gully 1½ miles north of Surry, no. 8493. See p. 383.

Extension south from northeastern Pennsylvania.[1] Inadequate specimens from the mountains of North Carolina may belong here.

A. SOLITARIA Rydb. Occasional on rich wooded slopes eastward to SURRY COUNTY: east of Cabin Point, no. 7979; and noted as far east as Sunken Meadow Beach and Surry. YORK COUNTY: dry open woods northwest of Tabb's, no. 7693. See pp. 371, 375.

GNAPHALIUM OBTUSIFOLIUM L., var. MICRADENIUM Weatherby. Local range extended westward. SUSSEX COUNTY: dry pine woods east of Burt, no. 7698. SOUTHAMPTON COUNTY: rich woods southeast of Ivor, no. 7697. DINWIDDIE COUNTY: border of dry pine woods about 1 mile northeast of Burgess, no. 7696. GREENSVILLE COUNTY: dry pine and oak woods about 1 mile north of Skipper's, no. 8890; similar habitat, within a few yards of the North Carolina line, southeast of Spring Church (2½ miles southwest of Dahlia), no. 8891. See p. 369.

G. OBTUSIFOLIUM, var. PRAECOX Fernald in RHODORA, xxxviii. 231, t. 434, figs. 1–3 (1936). Local range extended northward into HENRICO COUNTY: damp thicket, Solomon's Store, no. 7694.

G. CALVICEPS Fernald. Originally described from small plants (1–2.5 dm. high) from the region of Cape Henry, the species proves to be weedy and abundant on roadsides and in fallow fields westward

[1] It is well here to report the extension into North Carolina of ANTENNARIA PARLINII Fernald, var. ARNOGLOSSA (Greene) Fernald: argillaceous roadside-bank about 2 miles east of Spring Hope, Nash County, April 7, 1938, *Fernald & Long*, no. 7978.

into Dinwiddie, Sussex and Southampton Counties; in these disturbed ("cultivated") soils luxuriant, freely branched and up to 5.25 dm. high (many nos.).

Silphium atropurpureum Retz. To the two Virginian stations (one each in Wythe County and in Princess Anne County) recorded by Dr. Perry in Rhodora, xxxix. 290 (1937) add two in Surry County: calcareous, fossiliferous bushy slope near head of Sunken Meadow Creek, south of Claremont, no. 8498; dry woods northwest of Surry, no. 8894; and one in Greensville County: rich deciduous woods by Three Creek, north of Emporia, no. 9198. See p. 382.

S. compositum Michx., var. reniforme (Raf.) T. & G. To the only Virginian station (in Bath County) cited by Perry, l. c. 295 (1937) add one in Dinwiddie County: dry pine woods about 1 mile northeast of Burgess, no. 7700. See p. 369.

Chrysogonum virginianum L. Extending eastward at least to Prince George County (sandy wooded slopes along Powell's Creek, Garysville, no. 7980), Dinwiddie County (border of swampy woods, east of Burgess, no. 8499) and Greensville County (dry rich woods near Metcalf Branch, east of Emporia, no. 7981). See p. 375.

Heliopsis helianthoides (L.) Sweet. The typical large-headed plant, extending locally eastward to Surry County: rich calcareous woods near head of Sunken Meadow Creek, south of Claremont, nos. 8501, 9203. See p. 382.

Rudbeckia hirta L., var. monticola (Small) Fernald in Rhodora, xxxix. 457, 458 (1937). Greensville County: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 8503. James City County: rich woods south of Williamsburg, no. 8895.

A montane plant; here apparently isolated.

R. hirta L., var. Brittonii (Small) Fernald, l. c. Greensville County: with the last, no. 8504.

Also a montane type; here apparently isolated.

Actinomeris alternifolia (L.) DC. Eastward at least to Sussex County: rich woods, Moore's Mill, no. 7709; alluvial woods, Nottoway River, southwest of Lambs, no. 7710; and Surry County: rich calcareous wooded gullies along James River, Claremont Wharf, no. 9211.

*Coreopsis **oniscicarpa**, sp. nov. (tab. 533, tab. 534, fig. 1, 5 et 8), herba perennis glabra pallida 6–9 dm. alta erecta; caulibus subteretibus simplicibus supra corymboso-ramosis; foliis oppositis rariter alternis integris, basilaribus anguste oblanceolatis longe petiolatis laminis 3.5–7 cm. longis 0.5–1 cm. latis marginibus callosis, superioribus valde reductis bracteiformibus brevissimis; capitulis paniculato-corymbosis tenuiter pedunculatis pedunculis ad 1 dm. longis; involucri bracteis glabris, exterioribus 7–11 irregulariter biseriatis coriaceis

Photo. E. C. Ogden.

COREOPSIS ONISCICARPA: FIG. 1, plant, × ½; FIG. 2, head, × 1.

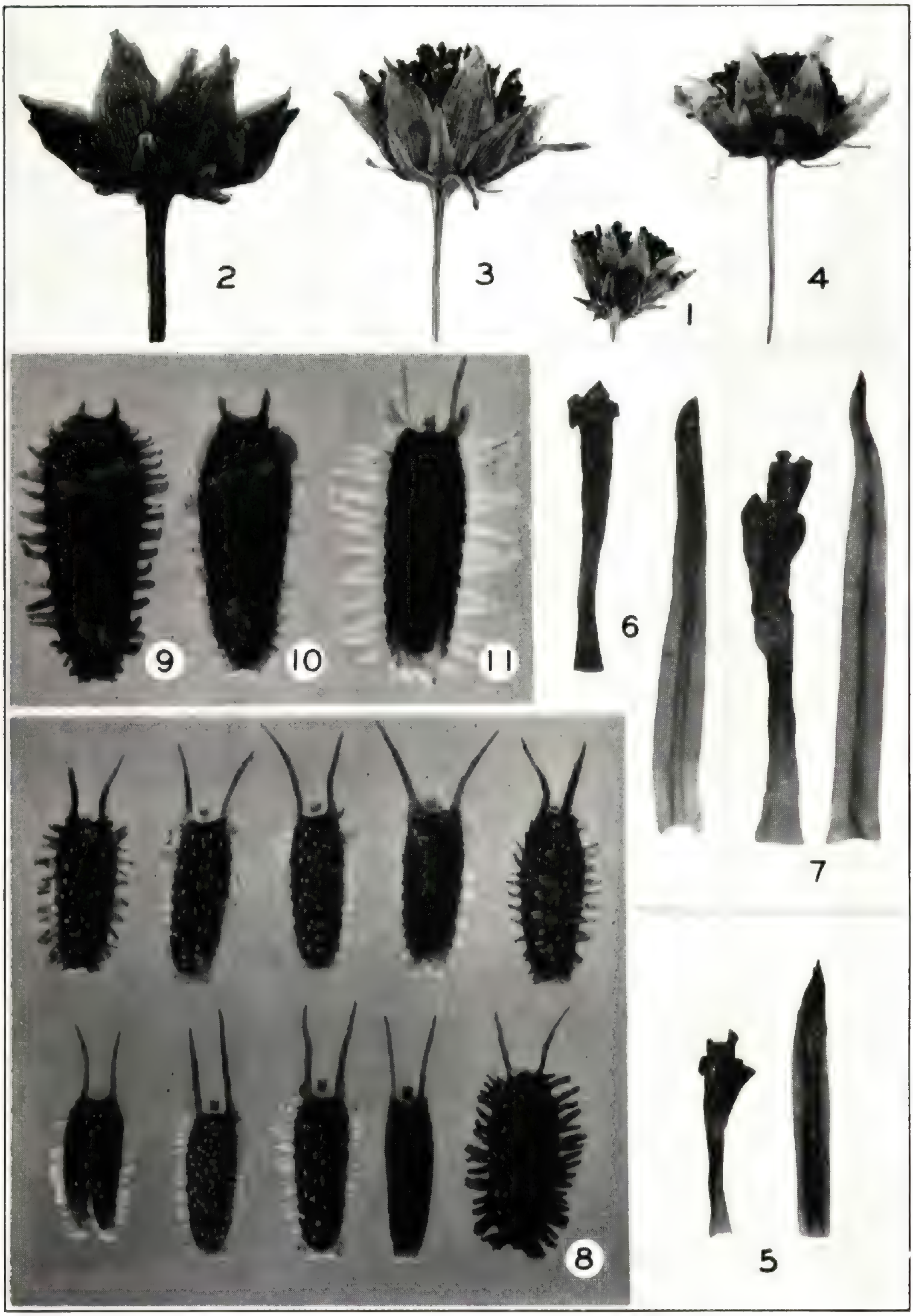


Photo. E. C. Ogden.

COREOPSIS ONISCICARPA: FIG. 1, involucre, × 2, from TYPE; FIG. 5, pale and disk-corolla, × 10, from TYPE; FIG. 8, achenes, × 10, showing variations, from TYPE.

C. GLADIATA: FIG. 2, involucre, × 2; FIG. 10, achene, × 10.

C. LONGIFOLIA: FIG. 3, involucre, × 2; FIG. 6, pale and disk-corolla, × 10; FIG 9, achene, × 10.

C. FALCATA: FIG. 4, involucre, × 2; FIG. 7, pale and disk-corolla, × 10; FIG. 11, achene, × 10.

lanceolatis 0.7–3 mm. longis, bracteis interioribus oblongis 6 mm. longis 2–3 mm. latis; floribus ligulatis ca. 8, ligulis aurantiaco-flavis cuneato-obovatis 0.8–1.6 cm. longis apice 3-lobatis lobo medio rotundato 1.5–3.5 mm. longis; paleis linearibus acutis 3.5–5 mm. longis; disci floribus corollis atropurpureis 2–3 mm. longis; achaeniis planis olivaceis plus minusve fimbriato-pectinatis, corpore 1.8–2.2 mm. longis 0.6–0.9 mm. latis faciebus plerumque valde papillatis, apice bi(rariter tri)-aristatis aristis 0.7–1.3 mm. longis antrorse setulosis.—VIRGINIA: ditches bordering sandy woods, Factory Hill, Nansemond County, August 26, 1936, *Fernald & Long*, no. 6728; wet thickets and ditches bordering sandy woods, Factory Hill, October 17, 1936, *Fernald & Long*, no. 6906 (TYPE in Gray Herb.); clearing in wet argillaceous pineland northeast of Courtland, Southampton County, September 11, 1937, *Fernald & Long*, no. 7712. Nos. 6728 and 6906 and some material of no. 7712 distributed as *C. gladiata* Walt.[1] See pp. 370, 379.

[1] Since the above account went into type *Coreopsis oniscicarpa* has been collected at several additional stations in southeastern Virginia and it has been found by my student, Mr. Robert K. Godfrey, to extend across eastern North Carolina from the boundary of Virginia to the boundary of South Carolina. It doubtless occurs in the latter state; and the scattered stations in southeastern Virginia are evidently northern outposts of a species primarily of North Carolina. The following are the additional stations:

VIRGINIA: seeping bank of ditch at margin of woods, about 2 miles southeast of Cleopus, Nansemond County, August 21, 1938, *Fernald & Long*, no. 9213; damp pineland north of Dahlia, Greensville County, October 12, 1938, *Fernald & Long*, no. 9653; edge of springy ditch bordering pine woods, east of South Quay, Nansemond County, October 13, 1938, *Fernald & Long*, no. 9654; springy roadside bank north of Factory Hill, Nansemond County, October 13, 1938, *Fernald & Long*, no. 9655 (topotype); peaty openings bordering wooded swamp along Mill Creek, about 1 mile north of Skipper's, Greensville County, October 14, 1938, *Fernald & Long*, no. 9657. NORTH CAROLINA: border of moist argillaceous pine and oak woods 1½ miles northeast of Dort School, Gates County, October 13, 1938, *Fernald & Long*, no. 9656; open pineland, Middlesex, Nash County, July 21, 1938, *R. K. Godfrey*, no. 5422; same station, October 9, 1938, *Godfrey & Kerr*, no. 6632; savannah, Edward, Beaufort County, October 11, 1938, *Godfrey & White*, no. 6887; pineland, Ft. Barnwell, Craven County, October 11, 1938, *Godfrey & White*, no. 6840; pineland, Grantsboro, Craven County, October 11, 1938, *Godfrey & White*, no. 6815; open pineland, Delway, Sampson County, August 25, 1938, *Godfrey*, no. 6164; savannah 8 miles southwest of Jacksonville, Onslaw County, September 1, 1938, *Godfrey*, no. 6464; savannah 5 miles east of Jacksonville, August 6, 1938, *Godfrey*, no. 5805; savannah 5 miles west of Richland, Duplin County, August 6, 1938, *Godfrey*, no. 5882; savannah, Burgaw, Pender County, August 7, 1938, *Godfrey*, no. 5921; margin between sandhill and peaty pineland, 8 miles south of Aberdeen, Scotland County, October 12, 1938, *Godfrey*, no. 6954; open pineland, Hallsboro, Columbus County, August 6, 1938, *Godfrey*, no. 6250; open pineland 7 miles southwest of Wilmington, Brunswick County, August 28, 1938, *Godfrey*, no. 6207.

Mr. Godfrey calls my attention to the habital similarity (in narrow basal and opposite cauline leaves) of *Coreopsis oniscicarpa* to *C. linifolia* Nutt. That more southern species, as shown by specimens in the Gray Herbarium so named by Sherff, has the outer involucral bracts ovate and rounded at summit (2–3 mm. broad, the lanceolate or lance-deltoid and tapering outer bracts of *C. oniscicarpa* only 0.6–1.3 mm. broad), the inner bracts 3.5–5 mm. broad (in *C. oniscicarpa* 2–3), and the glabrous faced achenes 3–3.5 mm. long (the strongly papillate, though finally glabrate, achenes of *C. oniscicarpa* only 1.8–2.2 mm. long). The type of *C. linifolia*, as also of *C. callosa* Bertol., referred by Sherff to it, came from Alabama and Sherff cites specimens only from Florida, Alabama and Mississippi, although there are specimens in the Gray Herbarium, labeled by him *C. linifolia*, from southeastern South Carolina, Georgia and Texas. Sherff's statement of range is "North Carolina to Florida, thence west-

The original material collected at Factory Hill was in bud and was referred tentatively to *C. gladiata*, this misidentification carelessly perpetuated in labeling later collections. However, as defined by Sherff in his *Revision of the Genus Coreopsis*,[1] which came out subsequent to our discovering the Virginia plant, *C. gladiata* has the basal leaves elliptic-oblong or oblanceolate, with blades 1–2.5 cm. broad; cauline leaves alternate; outer involucral bracts up to 6 mm. long, the inner 8–12 mm. long (our FIG. 2); and essentially glabrous black achenes 3.2–3.5 mm. long (our FIG. 10). *C. oniscicarpa* (from *Oniscus*, the sowbugs, etc.) in its narrow leaves is as near *C. longifolia* Small (FIGS. 3, 6 and 9) and *C. falcata* Boynton (FIGS. 4, 7 and 11). The contrasts between the three may be expressed in tabular form. They are also displayed in PLATE 534.

	C. LONGIFOLIA	C. FALCATA	C. ONISCICARPA
Leaves	Alternate	Alternate	Mostly opposite
Outer involucral bracts	Thin, 2–5 mm. long	Thin, 4–7 mm. long	Firm, 1–3 mm. long
Inner involucral bracts	6-12 mm. long, acutish	8–10 mm. long, acutish	6 mm. long, obtuse
Ligules	1.5–2.5 cm. long	1.3–2.3 cm. long	0.8–1.6 cm. long
Disc-corollas	3.5–4.5 mm. long	3.5–4 mm. long	2–3 mm. long
Pales	1 cm. long	6 mm. long	3.5–5 mm. long
Achenes	3.5–4.3 mm. long, the fringe much shorter than the breadth (1.1–1.6 mm.) of achene, faces glabrous	3.5–4.5 mm. long, the fringe as long as the breadth (0.8–1.2 mm.) of the achene, faces glabrous	1.8–2.2 mm. long, the fringe much shorter than the breadth (0.5–0.8 mm.) of the achene, faces copiously papillate

Coreopsis oniscicarpa is, then, completely segregated from its more southern allies by its usually opposite leaves, its smaller involucres, ligules and disk-corollas, and by the tiny achenes with papillate surfaces and with relatively long awns. Near Factory Hill, the type station, it is only about 3 miles (across Blackwater River) from the

---

wardly to Alabama and Mississippi." The reputed occurrence in North Carolina of *C. linifolia* has no support in Sherff's citation of specimens; and Mr. Godfrey, who spent a long season exploring eastern North Carolina, bringing back to the Gray Herbarium 3500 series of vascular plants, got *C. oniscicarpa* southward practically to the South Carolina line and found *C. falcata* in abundance but saw no *C. linifolia*. It is probable that the unexplained report of *C. linifolia* as extending northward to North Carolina originated with material of *C. oniscicarpa*.

[1] Field Mus. Nat. Hist. Bot. Ser. xi. no. 6 (1936).

type station of *Chrysopsis Longii*, *Desmodium ciliare* var. *lancifolium* and *Sanicula marilandica* var. *petiolulata*. It is there only a few miles from the type station of *Lespedeza capitata* var. *hirtiformis*, while its area northeast of Courtland (no. 7712) is the type station for *Solidago perlonga*.

*C. LANCEOLATA L., var. VILLOSA Michx. HENRICO COUNTY: scattered in dry woods (exact locality not stated), May, 1933, *S. B. Kovacs* (sent from University of Richmond to the Gray Herbarium as *C. pubescens*).

Not cited by Sherff, Revis. Gen. Coreopsis, 344 (1936) from Virginia.

*C. GRANDIFLORA Hogg. PRINCESS ANNE COUNTY: border of pine woods near Creeds, *F. & G.*, no. 4515. Escape from cultivation generally.

Although Sherff, l. c. 353, gives the mystifying range "Missouri and Kansas southward to Florida," etc., he cites material from Georgia; however, he notes none on the Atlantic slope from north of there. Our material, though young, seems inseparable from the plant of Little Stone Mountain, cited by Sherff.

*COREOPSIS **heterogyna**, sp. nov. (TAB. 335, FIG. 1–9), planta perennis; caulibus valde corrugatis arcuato-adscendentibus 9 dm. altis basi pilosis; foliis caulinis primariis 6-jugis late oblanceolatis acutis longe petiolatis, petiolis 0.5–1 dm. longis, laminis 9–13 cm. longis 2–3.5 cm. latis utrinque pilosis; foliis superioribus subpetiolatis; pedunculis 1–2.5 dm. longis; involucri bracteis exterioribus 9 firmis deltoideo-lanceolatis 7–9 mm. longis mox reflexis margine albido-hyalinis; bracteis interioribus ovatis 1.5–1.7 cm. longis 0.7–1 cm. latis; ligulis plerumque 8 flavis cuneato-obovatis 2 cm. longis apice 3-lobatis; floribus tubulosis aurantiacis; paleis lineari-attenuatis deinde 1–1.2 cm. longis; achaeniis diversis, minoribus (sterilibus vel substerilibus) cuneato-oblongis subplanis corpore 3–3.5 mm. longo 0.7–1.5 mm. lato utrinque laevi alis albidis 0.3–0.5 mm. latis, majoribus late obovatis vel reniformibus valde concavis corpore 3.5–4 mm. longo 2–2.5 mm. lato dorso laevi vel plus minusve verrucoso-muriculato ventre (valde concavo-excavato) plus minusve aristato-muriculato alis brunneis 1–1.5 mm. latis.—VIRGINIA: rich alluvial woods and thickets back of sand-beach of James River, below Sunken Meadow Beach, Surry County, June 14, 1938, *Fernald & Long*, no. 8506 (TYPE in Herb. Gray, ISOTYPE in Herb. Phil. Acad). See p. 383.

It is doubtless bold to propose another species in *Coreopsis*, § *Eucoreopsis;* but of the temperate North American species I can find

none with achenes like the large central ones[1] of *C. heterogyna*. The newly proposed species is obviously a member of the series including *C. lanceolata* L., *C. corninsularis* Sherff, *C. debilis* Sherff, *C. intermedia* Sherff, *C. pubescens* Ell., *C. heterolepis* Sherff, *C. grandiflora* Hogg and *C. auriculata* L. From many of these it stands apart on superficial as well as technical characters. *C. auriculata* is a stoloniferous plant with the lower leaves rounded or ovate and the small achenes (FIGS. 14 and 15) with narrow incurved wings. *C. lanceolata* is subscapose (with the rather small and often pinnately cleft leaves crowded at base), with inner involucre only 8–12 mm. long, the outer (FIG. 12) remaining appressed-ascending, pales only 4–6 mm. long, achenes (FIG. 13) smaller and with narrower wings. *C. corninsularis* is even smaller, 3–4 dm. high, with leaves only 1–6 mm. wide, outer involucre only 3–5 mm. long and of linear bracts, inner about 1 cm. long; the achenes smaller and with wings only 0.5–0.75 mm. wide. *C. debilis* is smaller still, with peduncles only 1–3 cm. long, ligules only 1 cm. long, inner involucre 7–8 mm. long and bodies of achenes only 2 mm. long and 1 mm. wide. *C. heterogyna* traces, by Sherff's key, nearly to his *C. intermedia* from Texas, a plant I have not seen. He describes it, however, as having petioles at most 4.5 (instead of 5–10) cm. long, blades obtuse (instead of acute), chiefly sessile (instead of petioled), outer involucral bracts lanceolate or linear-lanceolate and 4–8 mm. long (instead of deltoid-lanceolate and 7–9 mm. long), inner broadly lanceolate and 12–14 mm. long (instead of ovate and 1.5–1.7 cm. long), body of larger achenes 2–3 mm. long and 1.3–2 mm. wide, with wing only 0.2–0.4 mm. wide (instead of body 3.5–4 mm. long and 2–2.5 mm. wide, with wing 1–1.5 mm. wide). The large achene with broad wing and the long-petioled and acute leaves unite with the other characters to keep *C. heterogyna* apart. *C. pubescens* has relatively short elliptic to oblong-ovate leaf-blades, outer and inner involucres subequal, with the outer linear-lanceolate, pales at most 8 mm. long, achenes with bodies at most 3 mm. long, their wings only about 0.5 mm. wide. *C. heterolepis* has some of the leaves dissected, outer involucral bracts slenderly linear, inner bracts short, achenes oblong and at most 1.7 mm. long and with wing only 0.2–0.4 mm. broad. *C. grandiflora* has narrow leaves or leaf-segments (often

[1] Although the fact is not sharply brought out in Sherff's Revision of the Genus Coreopsis, most (if not all) the species of this series have achenes of quite different shapes and sizes. His measurements are presumably taken from the largest and central ones.

Photo. H. G. Fernald.

COREOPSIS HETEROGYNA: FIG. 1, isotype, × ½; FIG. 2, involucre, × 1; FIG. 3, pale, × 4; FIG. 4, disk-flower, × 4; FIGS. 5 and 6, large central achenes (dorsal view), × 4; FIG. 7, central achene (ventral view), × 4; FIGS. 8 and 9, smaller achenes, × 4.

C. GRANDIFLORA: FIG. 10, involucre, × 1; FIG. 11, large central achene (dorsal view), × 4.

C. LANCEOLATA: FIG. 12, involucre, × 1; FIG. 13, large central achene (dorsal view), × 4.

C. AURICULATA: FIGS. 14 and 15, achenes (dorsal and ventral views), × 4.

nearly linear-filiform), outer narrow involucral bracts appressed-ascending to maturity (FIG. 10), pales at most 7 mm. long and achenes (FIG. 11) up to 2.5 mm. long, with narrow wing.

C. AURICULATA L. GREENSVILLE COUNTY: rich deciduous woods by Metcalf Branch, east of Emporia, nos. 7982, 8507; rich deciduous woods by Three Creek, north of Emporia, no. 8509. SURRY COUNTY: calcareous, fossiliferous bushy slope near head of Sunken Meadow Creek, south of Claremont, no. 8508.

The only definite region of Virginia for this species cited by Sherff is Bedford County.

HELENIUM NUDIFLORUM Nutt. GREENSVILLE COUNTY: peaty and argillaceous clearing about 4 miles southeast of Emporia, no. 8511.

*ANTHEMIS ARVENSIS L., var. AGRESTIS (Wallr.) DC. SUSSEX COUNTY: roadside south of Stony Creek, no. 8513. GREENSVILLE COUNTY: cultivated field, 1 mile south of Emporia, no. 7983; seen rather generally through the region.

*CIRSIUM REPANDUM Michx. SOUTHAMPTON COUNTY: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, no. 8516.

First from north of North Carolina.

*CNICUS BENEDICTUS L. DINWIDDIE COUNTY: in and about a newly seeded clover-field, southwest of Petersburg, no. 7986.

*SERINIA OPPOSITIFOLIA (Raf.) Ktze. SOUTHAMPTON COUNTY: roadside-ditch bordering alluvial woods, bottomland of Meherrin River, near Haley's Bridge, no. 8517.

Extension north from South Carolina.

*LACTUCA HIRSUTA Muhl. SOUTHAMPTON COUNTY: border of dry pine woods west of Adams Grove, no. 7720; dry white sand in woods, Terrapin Ridge, east of Drewryville, no. 9226. SUSSEX COUNTY: border of dry woods near Assamoosick Swamp, about 2 miles northeast of Homeville, no. 9227.

Typical *Lactuca hirsuta* is apparently rare. Familiar with the wide-ranging northern plant (Prince Edward Island to Virginia and less commonly to Louisiana and Texas), in which the stem is quite glabrous, the leaves glabrous or mostly so except for the midrib villous beneath, and the panicle commonly broad and subcorymbiform, we were at once struck by the great disparity of no. 7720, which attracted us, while we were driving past it, by its slender cylindric or racemiform panicle. We were further struck, when collecting it, by its stem densely villous on the lower fourth and the leaf-surfaces copiously pilose (almost velvety to the touch). In the Gray Herbarium this highly pubescent plant can be matched only by an old sheet

from Louisiana (*Hale*) which Torrey & Gray had cited under their *L. elongata*, γ. *sanguinea* (Bigel.) Torr. & Gray, Fl. N. Am. ii. 496 (1843). Torrey & Gray cited only four collections, two of which (from Massachusetts and Louisiana) are before me. The Massachusetts plant (type or isotype of *L. sanguinea* Bigelow) is the common extreme with glabrous stem and glabrous leaf-surfaces. One of Hale's Louisiana specimens is quite glabrous throughout (*L. hirsuta*, forma *calvifolia* Fernald in Rhodora, xxii. 156 (1920)), the other is the rare extreme with villous lower internodes, pilose leaf-surfaces and slender racemiform panicle (4 dm. long, 7 cm. in diameter). Torrey & Gray's description was all-inclusive: leaves "mostly hirsute-pubescent (as well as the stem) either throughout or on the midrib beneath." In the Synoptical Flora, Gray gave a similar inclusive account but, judging from the material in the Gray Herbarium, even at that late date he had only 5 specimens before him (2 from Massachusetts, 2 from Louisiana and 1 from Texas) and he gave its northeastern limit as "E. Massachusetts." Today, with 90 specimens in the Gray Herbarium and that of the New England Botanical Club, showing a range northeastward to Nova Scotia and Prince Edward Island, we can better evaluate the characters.

All material from eastern Canada and New England is consistent in having glabrous or very rarely sparsely hirsute lower internodes, glabrous or at most (and very exceptionally) sparsely pilose leaf-surfaces, with the midribs of the lower leaves villous (or in forma *calvifolia* glabrous), and the inflorescence, when well developed, corymbiform-paniculate, 1.5–6 dm. long by 0.5–5 dm. broad. The material in the Gray Herbarium from west and south of New England is too scanty for generalization. Most of it (from New Jersey, Virginia, Louisiana and Texas) is like the essentially uniform plant of New England. Our specimens above cited from southeastern Virginia, and one of the Hale sheets from Louisiana, as already noted, stand apart in having the lower internodes densely villous, both leaf-surfaces copiously pilose and the inflorescences racemiform (3–4.5 dm. long, by 7–10 cm. in diameter).

So accustomed are we to considering the plant of wide range (common in much of New England) as typical *Lactuca hirsuta* Muhl. that the original diagnosis published by Nuttall is a bit startling:

2. **hirsuta* Muhl. Catal. Lower part of stem and leaves hirsutely pilose, radical ones lyrate, segments truncate, subdentate, the upper leaves

partly runcinate-pinnatifid; flowers racemose, squamae subulate. Hab. in Pennsylvania. Pappus stipitate. *v. s.* In Herb. Muhl.—Nutt. Gen. ii. 124 (1818).

In his Catalogue (1813) Muhlenberg's description had been altogether too vague, he merely noting the "*Calix. Corolla*" as "lut-purp" (obviously referring to the yellow flowers and the purple involucres), with the only other character of the plant "hairy." In the 2-volume manuscript of Muhlenberg's unpublished *Florula Lancastriensis* (i. 552) in the library of the Gray Herbarium he gave a detailed characterization of the plant, under an unpublished name more appropriate than the published *L. hirsuta*. The pertinent phrases, which show what Muhlenberg had in mind, are as follows: "caule erecto (infra) hirsuto, supra glabro . . . foliis . . . subtus pilosis margine ciliatis, caulinis, sessilibus simplicibus raris." Muhlenberg's unpublished "foliis subtus pilosis" and Nuttall's published "leaves hirsutely pilose" (without restricting the pilosity to the midrib or the *lower* surface) have made it most important to see exactly what Muhlenberg had before him and what Nuttall had seen in Muhlenberg's herbarium. Dr. Pennell has most kindly sent me for examination all the material of *L. hirsuta* in the herbarium of the Academy of Natural Sciences of Philadelphia. This includes Muhlenberg's original sheet and another which Nuttall had labeled. The Muhlenberg type from the Lancaster region (although the label gives no clue to locality) is quite like our no. 7720, except that the inflorescence is extremely young and undeveloped, with only very young heads and the branches not yet elongated. A second sheet, erroneously labeled by Thomas Nuttall "*Galathenium Floridanum. Mulgedium Floridanum*" (presumably through transfer of labels[1]) has two specimens. One is essentially like the Muhlenberg type of *L. hirsuta*, but more complete and with better-developed heads. The other, more sparsely pubescent (or subglabrous) except the villous midrib beneath, has the slenderest of racemiform young panicles and is transitional between the extreme *L. hirsuta* (the type) and the smooth-stemmed *L. sanguinea* Bigel. This sheet was presumably part of the original collection of Muhlenberg's from near Lancaster.

A most important sheet is one from Porter's herbarium, a plant

[1] *Galathenium floridanum* (L.) Nutt. was based on *Sonchus floridanus* L. and *Mulgedium floridanum* (L.) DC.; and Nuttall correctly placed it in the group (*Galathenium* Nutt. being merely a renaming of *Lactuca* L.) with blue flowers. *Lactuca hirsuta* has yellow flowers.

collected in September, 1868, by McMinn in Elk County, in northwestern Pennsylvania, at the northern margin of the Allegheny Plateau; for the Elk County plant has the lower internodes of the stem and the leaf-surfaces as strongly pubescent as in the Muhlenberg type and the similar plants of Virginia and Louisiana, but the large and strongly branching panicle as corymbiform as in extreme *L. sanguinea*. In involucre and achenes the McMinn material is likewise inseparable from the latter.

From New York state the very few specimens seen are characteristic *Lactuca sanguinea*. At least the plant from near Cayuga Lake is clearly described as having the "leaves sparingly and coarsely setose along the midrib";[1] and Dr. House, who has most kindly sent me for study the series in the New York State Museum, can find only two sheets properly referable to the inclusive *L. hirsuta*. These are very characteristic *L. sanguinea* and both from the Champlain and upper Hudson drainage in the northeastern corner of the state.

Returning to Pennsylvania and New Jersey, the sheets at the Philadelphia Academy, including those of the Philadelphia Botanical Club, are all (except the Muhlenberg type and the Nuttall counterpart of it) characteristic *Lactuca sanguinea*, and all from the southern half of New Jersey.

As a result of the present study I am unable to keep apart as species *Lactuca hirsuta* and the usually very different *L. sanguinea;* but, whereas typical villous-stemmed and pilose-leaved *L. hirsuta* is very rare anywhere and not known north of Pennsylvania nor recently collected in the type-region, the smoother variety (*L. sanguinea*) is wide-ranging over much of the eastern portion of the United States and the Maritime Provinces and often frequent or common, as in most of New England, though as often absent from or very rare in adjacent areas, like New York, Pennsylvania and northern New Jersey. Much herbarium-material is erroneously identified, for, as pointed out by Wiegand and me in 1910, the key-character (villosity of the midrib) relied upon both in Gray's Manual and in Britton's is quite misleading. We then gave the significant differences between *L. hirsuta* and *L. canadensis* L.,[2] both of which may have the midrib

[1] Wiegand & Eames, Fl. Cayuga L. Basin, 427 (as *L. hirsuta*).

[2] In 1920 (Rhodora, xxii. 9–11) Wiegand published his very usable revision of the variations of *Lactuca canadensis* L. He did not, however, personally investigate the type of the species but deduced from the earlier treatment of Gray that "it is to be presumed that the Kalm specimen [the type] had divided leaves." Wiegand, conse-

either pubescent or glabrous beneath. The diagnostic characters of *L. hirsuta* then worked out are here repeated:

L. HIRSUTA. Lateral leaf-divisions oblong-obovate, commonly broadest above the base, often more or less truncate, usually dentate; involucre, when fully developed, 16–22 mm. long: mature achenes 7–9 mm. long from base to tip of beak: pappus 9–12 mm. long.

The bibliography of the three variations of *Lactuca hirsuta* follows:

LACTUCA HIRSUTA Muhl., var. **genuina.** Lower internodes of stem densely villous: leaves copiously pilose on both surfaces.—*L. hirsuta* Muhl. Cat. (1813); Nutt. Gen. ii. 124 (1818); Gray, Syn. Fl. N. Am. i². 442 (1884), in part only; Fernald & Wiegand in RHODORA, xii. 145 (1910), in part only. "*L. villosa* Muhl. *fl. Lancastr. ined.*" ex Torr. & Gray, Fl. N. Am. ii. 497 (1843) as synonym, not Jacq. (1798).—Dry woods and openings, very local, Pennsylvania to Virginia and Louisiana.

Var. **sanguinea** (Bigel.), comb. nov. Stem glabrous or essentially so throughout: lower leaves with midrib villous beneath, the surfaces glabrous or only sparsely pilose.—*L. sanguinea* Bigel. Fl. Bost. ed. 2: 287 (1824). *Galathenium sanguineum* (Bigel.) Nutt. Trans. Am. Phil. Soc. vii. 444 (1841). *L. elongata*, γ. *sanguinea* (Bigel.) Torr. & Gray, l. c. 496 (1843).—Dry open woods and clearings, Prince Edward Island to western New York (presumably beyond), south to Virginia and less commonly to Louisiana and Texas.

Forma CALVIFOLIA Fernald. Leaves and stems glabrous throughquently treated as var. *typica* a plant with "Leaves with linear-falcate. . . lobes." The Linnean description indicated no such leaf, he saying "foliis lanceolato-ensiformibus dentatis," nor does the photograph of the type which Mr. Savage has kindly supplied me. The Kalm plant (type of *L. canadensis*) is characteristic *L. integrifolia* Bigel. or *L. canadensis*, var. *integrifolia* (Bigel.) Gray. Wiegand's *L. canadensis*, var. *typica*, taking for it the first name used varietally (and incidentally as a species) is

L. CANADENSIS L., var. LONGIFOLIA (Michx.) Farwell in Papers Mich. Acad. Sci. ii. 45 (1923). *L. longifolia* Michx. Fl. Bor.-Am. ii. 85 (1803). *L. elongata* Muhl. in Willd. Sp. Pl. iii. 1525 (1804). *L. elongata*, α. *longifolia* (Michx.) Torr. & Gray, Fl. N. Am. ii. 498 (1843). *L. canadensis*, var. *typica* Wiegand in RHODORA, xxii. 10 (1920). *L. canadensis*, var. *elongata* (Muhl.) Farwell in Pap. Mich. Acad. Sci. ii. 46 (1923).

In 1903 I examined Michaux's type of his *Lactuca longifolia* in Paris and made the memorandum that it had the middle and lower leaves as defined by Michaux: "Folia interdum versus medietatem laciniis 2–4-subruncinata, margine integerrima" and "foliis . . . amplexicaulibus."

In ordering up the material of *Lactuca*, the following combinations are required.

LACTUCA CANADENSIS L., var. OBOVATA Wieg., forma **Steelei** (Britton), comb. nov. *L. Steelei* Britton, Man. 899 (1901).

Forma *Steelei* seems to differ in no way from var. *obovata* except in having the stem quite villous nearly to the top and the midribs of the leaves villous; whereas var. *obovata* has the stem glabrous, except sometimes at base, and the leaves commonly glabrous.

L. LUDOVICIANA (Nutt.) Riddell, forma **campestris** (Greene), comb. nov. *L. campestris* Greene, Pittonia, iv. 37 (1899).

Differing from the yellow-flowered *Lactuca ludoviciana* only in having bluish flowers and occurring through essentially the same range.

out.—RHODORA, xxii. 156 (1920).—Scattered through the range of var. *sanguinea*.

*HIERACIUM FLORENTINUM All. PRINCE GEORGE COUNTY: roadsides and fields, Camp Lee, no. 8519.

A most undesirable weed, one of the worst pests of hay-fields in southern Canada and the northeastern states.

EXPLANATION OF PLATES 509–535

PLATE 509. PASPALUM BIFIDUM (Bertol.) Nash, var. PROJECTUM, n. var.: FIG. 1, plant, × ⅖, from east of Burt, Virginia, *Fernald & Long*, no. 7239 (TYPE); FIG. 2, sheath, × 4, from TYPE; FIG. 3, spikelet, showing 1st glume, × 10, from TYPE.

PLATE 510. BULBOSTYLIS CAPILLARIS (L.) C. B. Clarke: FIG. 1, TYPE of *Scirpus capillaris* L., × 1, courtesy of Mr. S. SAVAGE; FIG. 2, base, × 2, of TYPE of *Stenophyllus capillaris* (L.) Britton, var. *cryptostachys* Fernald; FIG. 4, inflorescences, × 1, of the latter.

Var. CREBRA, n. var.: FIG. 4, TYPE, × 1; FIG. 5, base of TYPE, × 2.

Var. ISOPODA, n. var.: FIG. 6, inflorescences, × 1, of TYPE.

PLATE 511. CAREX DIGITALIS Willd.: FIG. 1, inflorescence, × 1, from Brookland, District of Columbia, May 23, 1912, *Holm;* FIG. 2, inflorescence, × 1, from Lake Chautauqua, New York, June 5, 1893, *Churchill.*

Var. MACROPODA, n. var.: FIG. 3, plant, × 2/5, of the TYPE; FIG. 4, summit of inflorescence, × 1, from Wilmington, North Carolina, *M. A. Curtis.*

PLATE 512. SMILACINA RACEMOSA (L.) Desf.: summit of one of the TYPE specimens, × 1, of *Convallaria racemosa*, L. in Hortus Cliffortianus (Herb. Clifford). Kindness of Mr. JOHN RAMSBOTTOM.

PLATE 513. SMILACINA RACEMOSA (L.) Desf., var. CYLINDRATA, n. var.: FIG. 1, portion of flowering plant, × 1, from campus of University of Richmond, Westhampton, Virginia, May 12, 1927, *F. H. W.;* FIG. 2, fruit of the TYPE.

PLATE 514. COMPTONIA PEREGRINA (L.) Coulter: FIG. 7, young (autumnal) staminate aments, × 1, from Jaffrey, New Hampshire, *Robinson*, no. 397; FIG. 8, fruiting aments, × 1, from Pembroke, Maine, *Fernald*, no. 1698; FIG. 9, portion of branchlet, × 10, to show pubescence, from no. 1698; FIG. 10, lower surface of leaf, × 10, from no. 1698.

Var. ASPLENIFOLIA (L.) Fernald FIGS. 1 and 2, drawings of staminate (his fig. 7) and pistillate (his fig. 6) branches, × 1, from Plukenet's illustration of his *Myrti brabanticae affinis americana, foliorum laciniis asplenii modo divisis*, basis of *Myrica asplenifolia* L.; FIG. 3, young (midsummer) staminate aments × 1, from south of Franklin, Virginia, *Fernald & Long*, no. 8229; FIG. 4, pistillate (fruiting) aments, × 1, from no. 8229; FIG. 5, portion of branchlet, × 10, to show puberulence, from no. 8229; FIG. 6, lower surface of leaf, × 10, from no. 8229.

PLATE 515. POLYGONUM SETACEUM Baldwin, var. TYPICUM: FIG. 1, lower surface of leaf, × 10, from north of Blackwater River, Princess Anne County, Virginia, *Fernald & Long*, no. 3916; FIG. 2, upper surface of leaf, × 10, from no. 3916.

Var. INTERJECTUM, n. var.; FIG. 3, lower surface of leaf, × 10, from the TYPE; FIG. 4, upper surface of leaf, × 10, from the TYPE.

Var. TONSUM, n. var.: FIG. 5, TYPE, × ⅖; FIG. 6, upper surface of leaf, × 10, from the TYPE.

PLATE 516. CLAYTONIA VIRGINICA L.: FIG. 2, tip of inflorescence, × 1, from Louisville, Kentucky, *L. G. Blumer*, no. 231.

Forma MICROPETALA, n. form: FIG. 1, TYPE, × 1.

PLATE 517. RANUNCULUS ALLENII Robinson: FIG. 5, portion of flowering plant, × 1, from Tabletop Mts., Gaspé County, Quebec, *Fernald, Dodge & Smith*, no. 25,759; FIG. 6, fruit, × 4, from no. 25,759.

R. ALLEGHENIENSIS Britton: FIG. 1, fruit, × 4, from Elk Mt., Pocahontas County, West Virginia, *C. A. & U. F. Weatherby*, no. 6416.

R. MICRANTHUS Nutt.: FIG. 2, plant, × 1, from Vesta, Wilson County, Tennessee, *Svenson*, no. 7746; FIG. 3, flowering tip, × 4, from no. 7746.

R. HARVEYI (Gray) Britton: FIG. 4, portion of flowering plant, × 1, from Little Rock, Arkansas, *H. E. Hasse.*

PLATE 518. RANUNCULUS ABORTIVUS L., var. INDIVISUS, n. var.: FIG. 1, TYPE, × ⅖; FIG. 2, fruit, × 4, from TYPE.

PLATE 519. RANUNCULUS ABORTIVUS L., var. ACROLASIUS, n. var.: FIG. 1, TYPE, × ⅖; FIG. 2, flower, × 4, from TYPE.

Var. EUCYCLUS Fernald: FIG. 3, basal leaf, × 1, from the TYPE.

PLATE 520. DENTARIA LACINIATA Muhl., var. COALESCENS, n. var. (all figs. × 1): FIG. 1, summit of fruiting plant (TYPE); FIG. 2, a single pinnatifid cauline leaf from the TYPE; FIG. 3, young plant (TYPE).

PLATE 521. RUBUS LONGII, n. sp.: fruiting branch, × 1, from the TYPE.

PLATE 522. RUBUS LONGII, n. sp.: FIG. 1, portion of primocane with foliage, × ¾, from TYPE; FIG. 2, portion of stem and base of petiole, to show pubescence, × 4; FIG. 3, upper surface of leaf, to show pubescence, × 10; FIG. 4, lower surface of leaf, to show pubescence, × 10.

PLATE 523. DESMODIUM CILIARE (Muhl.) DC., var. LANCIFOLIUM Fernald & Schubert, n. var.: TYPE, × ½.

PLATE 524. LESPEDEZA CAPITATA L., var. HIRTIFORMIS, n. var.: TYPE, × ⅖.

PLATE 525. POLYGALA VERTICILLATA L., var. DOLICHOPTERA, n. var.: FIG. 1, one of the TYPE-SPECIMENS, × 1; FIG. 2, portion of raceme, × 6, from the TYPE.

Var. AMBIGUA (Nutt.) Wood: FIG. 3, raceme, × 1, from southeast of Emporia, Virginia, *Fernald & Long*, no. 8333; FIG. 4, portion of raceme, × 6, from no. 8333.

PLATE 526. VIOLA KITAIBELIANA Roem. & Schultes: FIG. 5, flowering plant, × 1, from Switzerland, *F. O. Wolf* in W. Becker, Viol. Exsicc. VII. Lief. no. 180; FIG. 6, fruiting summit, × 1, from Bithynia, *Bornmüller*, no. 13,739; FIG. 3, calyx, × 2, from no. 13,739; FIG. 8, margin of sepal, × 8, from Bohemia, *Petrak*, Fl. Bohem. Morav. Exsicc. Lfg. IX. no. 830.

Var. RAFINESQUII (Greene) Fernald: FIG. 1, portion of flowering plant, × 1, from District of Columbia, *E. R. Reynolds* in Dowell, N. Am. Violets, no. 1A; FIG. 2, portion of plant in bud, from Lancaster County, Pennsylvania, May 11, 1901, *Heller;* FIG. 7, calyx, × 2, from Lancaster County, Pennsylvania, May 9, 1891, *Small;* FIG. 4, margin of sepal from same plant as FIG. 7.

PLATE 527. SANICULA MARILANDICA L., VAR. PETIOLULATA, n. var.: TYPE-SPECIMEN, × ½.

PLATE 528. FRAXINUS TOMENTOSA Michx. f. (all figs. × 1): FIGS. 1 and 2, lateral leaflet and samaras, after Michaux filius; FIGS. 3 and 4, lateral leaflets and samaras of *F. profunda* Bush from Kennett, Missouri, *Bush*, no. 447; FIGS. 5 and 6, portion of lateral leaflet and samaras from Drewryville, Virginia, *Fernald, Long & Smart*, no. 5891 (distrib. as *F. profunda*).

PLATE 529. FRAXINUS PENNSYLVANICA Marshall: FIG. 3, fruits, × 1, from Jamaica Plain, Massachusetts, *Faxon;* FIG. 4, fruits, × 1, from McCalls Ferry, Pennsylvania, *Rose & Painter*, no. 8169.

Var. AUSTINI, n. var.: FIG. 1, portion of TYPE, × 1, from Westfield, New Brunswick, *Fernald*, no. 2069; FIG. 2, fruits, × 1, from Closter, New Jersey, *C. F. Austin.*

PLATE 530. PLANTAGO VIRGINICA L.: FIG. 1, leaves and scapes, × 1, from Richmond, Virginia, May 13, 1911, *Churchill;* FIG. 2, upper surface of leaf, × 5, and FIG. 3, base of spike, × 5, both from same plant as FIG. 1.

var. VIRIDESCENS, n. var.: FIG. 4, plant, × 1, from TYPE-COLLECTION; FIG. 5, upper surface of leaf, × 5, and FIG. 6, base of spike, × 5, from TYPE.

PLATE 531. CHRYSOPSIS LONGII, n. sp.: FIG. 1, small plant, × ½, from TYPE-COLLECTION; FIG. 2, involucre, × 1, from TYPE; FIG. 3, disk-corolla, × 7, from TYPE; FIG. 4, achene, × 7, from TYPE-STATION, *Braxton Townsend*, no. 7725.

C. GOSSYPINA (Michx.) Nutt.: FIG. 5, involucre, × 1, from Muscogee County, Georgia, September 10, 1883, *J. D. Smith;* FIG. 6, disk-corolla, × 7, from same collection; FIG. 7, achene, × 7, from Augusta, Georgia, October, 1843, *Asa Gray.*

PLATE 532. SOLIDAGO PERLONGA, n. sp.: FIG. 1, plant, × ⅖, from Westhampton, Virginia, *Fernald & Long*, no. 7668; FIG. 2, characteristic reticulation of leaf, × 10, from the TYPE; FIG. 3, involucre, × 5, from no. 7668; FIG. 4, achene, × 10, from no. 7668.

S. AUSTRINA Small: FIG. 5, reticulation of leaf, × 10, from near Loganville, Georgia, *Small* (ISOTYPE); FIG. 6, involucre, × 5, from ISOTYPE; FIG. 7, achene, × 10, from ISOTYPE.

PLATE 533. COREOPSIS ONISCICARPA, n. sp.: FIG. 1, plant, × ½, from northeast of Courtland, Virginia, *Fernald & Long*, no. 7712; FIG. 2, head, × 1, from same collection.

PLATE 534. COREOPSIS ONISCICARPA, n. sp.: FIG. 1, involucre, × 2, from the TYPE; FIG. 5, pale and disk-corolla, × 10, from the TYPE; FIG. 8, achenes, × 10, showing variations, from TYPE.

C. GLADIATA Walt.: FIG. 2, involucre, × 2, from near Jacksonville, Florida, *A. H. Curtiss*, no. 1477, in part; FIG. 10, achene, × 10, from no. 1477.

C. LONGIFOLIA Small.: FIG. 3, involucre, × 2, from near Jacksonville, Florida, *Curtiss*, no. 6278; FIG. 6, pale and disk-corolla, × 10, from near Jacksonville, *Curtiss*, no. 1477 in part; FIG. 9, achene, × 10, from same collection.

C. FALCATA Boynton: FIG. 4, involucre, × 2, from north of Washington, North Carolina, *Wiegand & Manning*, no. 3410; FIG. 7, pale and disk-corolla, × 10, from no. 3410; FIG. 11, achene, × 10, from no. 3410.

PLATE 535. COREOPSIS HETEROGYNA, n. sp.: FIG. 1, ISOTYPE, × ½; FIG. 2, involucre, × 1; FIG. 3, pale, × 4; FIG. 4, disk-flower, × 4; FIGS.

5 and 6, large central achenes (dorsal view), × 4; FIG. 7, central achene (ventral view), × 4; FIGS. 8 and 9, smaller achenes, × 4.

C. GRANDIFLORA Hogg.: FIG. 10, involucre, × 1, from between Oconee and Gwinnett Counties, Georgia, July 14, 1893, *Small;* FIG. 11, large central achene (dorsal view), × 4, from Little Stone Mt., Georgia, *A. H. Curtiss*, no. 6467.

C. LANCEOLATA L.: FIG. 12, involucre, × 1, from Redding's Mill, Missouri, *E. J. Palmer*, no. 2386; FIG. 13, large central achene (dorsal view), × 4, from Alpena, Michigan, *Fernald & Pease*, no. 3565.

C. AURICULATA L.: FIGS. 14 and 15, achenes (dorsal and ventral views), × 4, from east of Emporia, Virginia, *Fernald & Long*, no. 8507.

TRILLIUM ERECTUM, VAR. BLANDUM, VAR. NOV.[1]

H. M. JENNISON[2]

(Plate 536)

Several years ago the author discovered and collected a *Trillium* belonging to the *Erecta* section of the genus, which apparently has not yet been described. The station of first discovery is near Knoxville, Tennessee. Subsequently it was collected near Bryson City, North Carolina. More recently still it was found growing in the Great Smoky Mountains National Park at a station on Deep Creek not far from Bryson City.[3] The first two stations may possibly be despoiled (one is practically so already), hence knowledge of its occurrence in the park is all the more significant.

The form in question (PL. 536, FIG. 1) is more readily distinguished from *Trillium erectum* var. *album* (Michx.) Pursh (FIG. 2) than are many well known "species" from one another. However, as a result of extensive observations in the field, as well as critical studies of herbarium specimens, the author is inclined to believe that it is best to regard it as a (biological) variety.

As commonly understood, *T. erectum* var. *album* has white petals and a red to brown ovary; Gates[4] to the contrary notwithstanding. Futhermore, Professor Dr. H. Humbert, of the Muséum National d'Histoire Naturelle, Paris, France, reported in a letter:

"J'ai fait examiner l'échantillon de *Trillium erectum* var. *album* de l'herbier Michaux; mais il n'est pas possible de juger sûrement la

[1] Contributions from the Botanical Laboratory, The University of Tennessee, n. s. 28.

[2] Printed at the author's expense to insure prompt publication.

[3] It has for a long time been known to Dr. B. C. Thomasson, Bryson City, N. C.

[4] Gates, R. R., The Genus Trillium. Ann. Mo. Bot. Garden **4**: 43–92 (1917).

couleur de l'ovaire, après une aussi longue conservation. J'inclinerais néanmoins à penser qu'il n'a jamais été blanc."

Trillium erectum, L. var. **blandum,** var. nov. (tab. 536, fig. 1), *T. erecto* simile; sepalis ovato-lanceolatis breviter acuminatis; petalis ochroleuco-albis ovatis, acutis vel obtusis; antheris flavis; ovario fructuque globoso albis vel viridi-tinctis.

Plants having essentially the same life-form as *T. erectum* L. and *T. erectum* var. *album* (Michx.) Pursh (pl. 536, fig. 2). Pedicel erect or nearly so. Flower-buds pendulous, taper-pointed, opening in late April or in May. Sepals 3, ovate-lanceolate, slightly exceeding the petals, apex short-acuminate; petals creamy-white, ovate, apex acute to obtuse; stamens 6, anthers yellow; ovary white; fruit globose, white or suffused with green, 3-sided, and thrice double-keeled, ripe in June. Pure colonies in heavily shaded rich woods-loam or humus at elevations from about 1000 to 2000 ft. above sea-level. Type: *Jennison* no. *2185* (Flora Great Smoky Mts. Nat'l Park); University of Tennessee Herbarium, Knoxville, Tenn., U. S. A.

Key to Trillium erectum and Varieties

A. Petals atropurpureous ..... *T. erectum* L.
AA. Petals white ..... B.
B. Ovary white; petals typically ovate-acute, cream-white .. var. *blandum.*
BB. Ovary atropurpureous, petals typically lanceolate-acuminate, white ..... var. *album.*

University of Tennessee,
Knoxville, Tennessee

The Persistence of Opuntia humifusa in Concord, Massachusetts.—A small but vigorous colony of *Opuntia humifusa* Raf. (*O. vulgaris* of Gray's Man., not Mill.) has been discovered recently (January, 1937) in Concord, Massachusetts by *A. H. Hepburn, Jr.* It is growing in thin soil on a flat-topped outcrop of granitic schist at the foot of Punkatasset Hill near the old Pratt nursery. The station is in an old field or pasture which has reverted to scrubby woods. In the not very distant future, it is probable that the *Opuntia* must gracefully withdraw in favor of *Polypodium virginianum.*

It is a fair presumption that this colony was introduced by Minot Pratt between 1850 and 1875, despite the fact that it is not mentioned in his botanical records (in manuscript) preserved in the Concord Library. Furthermore, A. W. Hosmer did not include *Opuntia* in either of the lists which he published in 1899 as a report on the status of the numerous Pratt introductions in Concord.[1] However, the

[1] Rhodora I: 170–171.

FIG. 1. TRILLIUM ERECTUM, var. BLANDUM.
FIG. 2. T. ERECTUM, var. ALBUM.

station is on Minot Pratt's farm and has every appearance of considerable age. Many of the plants fruited in 1938.—R. J. Eaton, Cambridge, Mass.

A tomentose Form of Cladrastis lutea.—**Cladrastis lutea** (Michx. f.) Koch, forma **tomentosa** Steyermark, f. nov., foliis subtus et pedicellis dense breviterque villosis.

Lower surface of leaves and pedicels densely short-villous.—Alabama: along rocky bluffs of Black Warrior river, near lock 14, Tuscaloosa Co., May 15, 1929, *E. J. Palmer*, no. 35387 (type in herbarium of Field Museum).

This form of the Yellow Wood is to be expected in other portions of the range of the species.—Julian A. Steyermark, Field Museum of Natural History, Chicago, Illinois.

Coldenia Nuttallii in Missouri.—In a collection of plants made in Crawford County, Missouri in 1935, 1936, and 1937, and sent to the writer for determination by Miss Cora Shoop (now Mrs. Julian A. Steyermark) who at that time was biology teacher at the Steelville high school, occurred a plant entirely unfamiliar. Upon examination it was found to be the western *Coldenia Nuttallii* Hook.

This little annual with small purplish-blue flowers and small conspicuously impressed-veined leaves is a native of sandy or open places in California, Nevada, Washington, Idaho, Utah, Arizona, New Mexico and Wyoming. The locality where it was found at Steelville, Missouri by Miss Shoop was on open, rocky slopes of a hill in the Steelville high school grounds. The plant was not abundant where it was found. A branch of the "Frisco" railroad runs along the base of this hill and most likely this annual plant has sprung up from seeds which originally were transported by the railroad from some one of the Western states which the "Frisco" line traverses.—Julian A. Steyermark, Field Museum of Natural History, Chicago, Illinois.

Volume 40, no. 479, including pages 425–464 and plates 521–530, was issued 12 November, 1938.

ERRATA

Page 24, line 19; *for* Pt *read* P+.
Page 52, line 33; *for* of *read* or.
Page 132, line 38; *for* **succinta** *read* **succincta**.
Page 136, line 27; for *469* read *470*.
Page 172, in table omit decimal points.
Page 281, line 6; *for* CXXIII *read* CXXII.
Plate 494: *for* BALDWINIANUS *read* BALDWYNIANUS.
Page 286, line 28; *for* Arkansas, Beaver *read* ARKANSAS: Beaver.
Page 286, line 29; *for* Oklahoma *read* OKLAHOMA.
Page 287, line 4; for *carolinense* read *carolinensis*.
Page 289, line 30, page 290, lines 20, 28, 35, 39 and 40, and page 291, lines 7, 10, 11 and 13; for *Renoutria* read *Reynoutria*.
Page 303, line 3; *for* 10,837 *read* 11,087.
Page 303, line 18; for *C* read *S*.
Page 303, line 39; for *typica* read *typicum*.
Page 308, line 29; for *arveniss* read *arvensis*.
Page 311, line 13; for *zizphoroides* read *zizyphoroides*.
Page 314, line 7; *for* uame *read* name.
Page 320, lines 6 and 12 and page 322, lines 27 and 31; for *Lynosyris* read *Linosyris*.
Page 377, line 16; *for* Vigrinia is *V.* READ Virginia is *Vitis*.
Plate 510 and page 395, lines 6, 19 and 24; for *pycnostachys* read *cryptostachys*.
Page 424, line 25; for *476* and *235–260* read *477* and *335–360*.
Page 435, line 29; *for* 398 *read* 378.
Page 455, line 38; *for* 383 *read* 382.
Page 458, line 18; *for* 364 *read* 369.

INDEX TO VOLUME 40

New scientific names are printed in full-face type

Abies, 149–153, 157, 162; balsamea, 73, 145, 148, 156, 160, 161, 163, 167, 169–171
Acer, 149–153, 157, 162, 166, 172, 180; sp., 167, 169, 170; floridanum, 380, 440, 441; rubrum, 148, 452; Rugelii, 133; saccharum, 145, 146, 161, 431, 433, f. **Rugelii, 133;** spicatum, 73, 145, 170
Aceraceae, 174
Acerates floridana, 378, 435, 454
Acorus, 183
Actinomeris alternifolia, 472
Addition to the Flora of Western Massachusetts, An unexpected, 424
Additional Notes on the Valerianellas of North America, 465
Additions to the Minnesota Flora, Extensions of Ranges and, 275
Adiantum pedatum, 382, 385
Aeschynomene virginica, 383
Aesculus discolor, 374, 441
Agastache nepetoides, 382, 455
Ageratum altissimum, 293
Agrimoinia, 334; Brittoniana, 333; Brittoniana occidentalis, 333; gryposepala, 334; striata, 333, 334, 357, pl. 500, var. **campanulata, 333,** 334, 357, **pl. 500**
Agrostis elata, 368
Alchemilla § Aphanes, 435; arvensis, 435; microcarpa, 435, 436, 445
Aletris, 61
Algae, 324
Allies in Western Canada, Silene Menziesii and, 212; Polygonum Kelloggii and its, 309
Allium vineale, 443
Alnus, 149, 153, 162; sp., 167, 169, 170; crispa, 145; incana, 145, 148, 156, 159–161, 163; rugosa, 252
Alopecurus carolinianus, 372, 387
Alsine, 213
Ambrosia integrifolia, 348; trifida β integrifolia, 348, f. **integrifolia, 347**
Amelanchier Fernaldii, 274
America, The Occurrence of Poa Chaixii in, 73
Ammophila, 110; breviligulata, 279
Ampelamus albidus, 282
Ampelanus, 282
An unexpected Addition to the Flora of Western Massachusetts, 424
Anacharis densa, 368, 385
Anagallis flava, 290
Anaphalis margaritacea, 218, 219, again, 218, f. anochlora, 218, var. occidentalis, 218, 219, var. revoluta, f. **arachnoidea, 219,** var. subalpina, 218
Andromeda glaucophylla, 145
Andropogon furcatus, 156
Anemonella, 375; thalictroides, 420
Angstroemia, 359
Annotated Catalogue of the Flowering Plants of Missouri, Validation of Combinations in Palmer and Steyermark's, 131
Anonymos aquatica, 339, 340
Another New Hampshire Station for Rhododendron maximum, 461
Anotites, 212–214; debilis, 213; Dorrii, 213; latifolia, 213, 214; Menziesii, 213; picta, 214; tenerrima, 213; tereticaulis, 213
Antennaria ampla, 471; fallax, var. calophylla, 471; munda, 383, 471; Parlinii, var. arnoglossa, 471; solitaria, 371, 375, 471
Anthemis arvensis, var. agrestis, 477
Aphanes australis, 436, 445
Apiastrum, 180
Apios americana, f. **pilosa, 179**
Aplectrum hyemale, 375, 408
Aquilegia formosa, ssp. callifax, 136, var. **callifax, 136**
Arabis, 373, 422, 430–432; canadensis, 423; dentata, 430; Drummondi, 423; georgiana, 422; glabra, 430; laevigata, 382, 422, 423; lyrata, 423; pycnocarpa, var. adpressipilis, 430, var. typica, 430; virginica, 290, 364, 372, 373, 422; viridis, 431, 432
Araceae, 183
Aralia nudicaulis, 163; racemosa, 382, 447
Arbutus, 68
Arctoa, 359
Arctostaphylos Uva-ursi, 145

Arenaria, 180, 182; lateriflora, 253; Nuttallii, 182; peploides, var. robusta, 462; serphyllifolia, 443
Arkansas, Two Undescribed Plants from, 71
Arisaema Dracontium, 377, 402, 431
Aristida dichotoma, var. Curtissii, 387; longespica, var. geniculata, 250; virgata, 387, 448
Artemisia campestris, subsp. caudata, 134, var. **caudata, 134**; caudata, 134; Stelleriana, 279; vulgaris, 443, subsp. Wrightii, 134; var. **Wrightii, 134**; Wrightii, 134
Arthrospira, 271; Gomontiana, 271; subsalsa, 272
Arundo Donax, 386
Asarum canadense, 333, f. **Phelpsiae, 333**, 357, **pl. 499**
Asclepiadaceae, 283
Asclepias kansana, 133; Meadii, 116; purpurascens, 454; syrica, var. **kansana, 133**
Ascophyllum, 228; nodosum, 228
Asimina parviflora, 366, 448; triloba, 375
Asplenium, 182
Aster, 148, 161, 163; sp., 156, 158; laevis, var. amplifolius, 254; puniceus, var. lucidulus, 252, 254; spinosus, 434; subulatus, 112, 113, var. euroauster, 112, var. obtusifolius, 112
Astragalus, 180; canadensis, 383, 436; cyaneus, 180; Engelmanni, 180; **mancus, 136**; puniceus, 181
Astragalinae, 180
Asymmetria, 27
Athyrium thelypteroides, 382, 385
Atrichum, 359
Atropis, 393
Axonopus furcatus, 369

Baccharis, 322; sarothroides, var. pluricephala, 321
Baldwin, J. T., Jr., Chromosomes of Kalmiopsis, 278
Baptisia tinctoria, 462; villosa, 468
Benzoin aestivale, 462
Betula, 149–153, 157, 162, 166; sp., 167, 169, 170; lutea, 145, 161; papyrifea, 145, 146, 148, 156, 159, 160, 161, 163; populifolia, 242; pumila, 160, var. glandulifera, 145
Betulaceae, 174
Bidens, 280, 348, 351; Beckii, 464; comosa, 247; coronata, 348–350, The Varieties of, 348, pl. 506, var. **brachyodonta, 349**, 350, 358, **pl. 506**, var. β tenuiloba, 348–351, var. **trichosperma**, 349, **350**, 351, 358, pl. 506, var. **typica, 349**, 350, 358, pl. 506; Eatoni, 352; frondosa, 352, f. **anomala, 352**, var. anomala, 352, var. puberula, 352; heterodoxa, 352, 358, pl. 507, var. agnostica, 352, 358, pl. 507, var. atheistica, 352, var. orthodoxa, 352, 358, pl. 507; **infirma, 351**, 358, **pl. 507**; laevis, 348; mitis, 348, 351, 358, pl. 506; puberula, 352; trichosperma, 348–350, var. tenuiloba, 350; vulgata, 352, f. **puberula, 352**, var. puberula, 352
Binomials for Native or Introduced Plants in Eastern North America, On Houttuyn's Overlooked, 288
Blake, Charles H., Wolffiella floridana in Massachusetts, 76
Blue-eyed grass, 462
Boehmeria cylindrica, var. Drummondiana, 253, var. scabra, 253
Boraginaceae, 341, 343
Botrychium ternatum, 151; virginianum, 290
Brachyelytrum erectum, 382, 387
Brasenia Schreberi, 251, 368, 415
Brassica, 306, 307, 309; adpressa, 306, 309; alba, 306; arvensis, 306–308, var. Schkuhriana, 308; geniculata, 308, 309; hirta, 306; incana, 309; **kaber, 306**, 308, var. **pinnatifida, 308**, var. **Schkuhriana, 308**; Names of three Species of, 306; nigra, 306; orientalis, 307; polymorpha, 307; sinapistrum, 308; villosa, 308
Braya, 296; pectinata, 304
Brierly, William B., The Relation of Pinus rigida to Physiographic Features and Soil Types in Central Massachusetts, 72
Bromus arvensis, 275; Kalmii, 462; purgans, 382, 385, f. laevivaginatus, 250; tectorum, 275
Brothera, 359
Bulbostylis, 391–395; **antillanus, 392**; barbata, 394; capillaris, 394, 395, 482, pl. 510, var. **crebra, 395**, 482, **pl. 510**, var. **isopoda, 395**, 482, **pl. 510**; **ciliatifolius, 391**; **coarctatus, 392**; **floridanus, 392**; **nesioticus, 392**; nesiotis, 392; **portoricensis, 392**; **stenophyllus, 391**

Burmannia biflora, 383
Buxbaumia aphylla, 372

Cacalia, 356; atriplicifolia, 357; **Muhlenbergii, 356;** reniformis, 356, 357; rotundifolia, 356, 357
Calliergon trifarium, 156, 167
Callirhoë, 460; alcaeoides, 461; digitata, 461; involucrata, 460, 461, var. **Bushii, 460,** 461; leiocarpa, 461; Papaver, 461; pedata, 461; scabriuscula, 461; triangulata, 461
Calopogon pulchellus, 180
Calothrix, 229; crustacea, 75
Caltha palustris, 382, 421
Calymperaceae, 359, 360
Calymperes, 359
Camassia **hyacinthina, 131;** scilloides, f. **Petersenii, 178**
Campanula rotundifolia, 251
Campylopus, 359
Canada, Silene Menziesii and Allies in Western, 212
Cardamine, 373; bulbosa, 422; hirsuta, 372; pratensis, 275; virginiana, 290
Carex, 77, 154, 155, 158, 249, 325–327, 330; sp. 158; abdita, 399; alata, 251, 330; albicans, 330, 331; in Willdenow's Herbarium, Carex foenea, C. straminea and, 325; albolutescens, 327, 330; albursina, 80, 81; argyrantha, 327, 328; artitecta, var. **subtilirostris, 79;** Barrattii, 381, 401, 402; blanda, 80; bromoides, 326, 382, 399; bullata, 381, 401, 402; Bushii, 460; Buxbaumii, 381, 401; caroliniana, 377, 401; Collinsii, 380, 401; communis, 252; comosa, 251; complanata, 401; crinita, 170; crus-corvi, var. virginiana, 376, 377; cumulata, 79; × **Deamii, 81;** decomposita, 251; digitalis, 374, 375, 400, 401, 482, pl. 511, var. **macropoda,** 400, **401,** 482, **pl. 511,** f. podostachys, 400; disticha, 326; Emmonsii, 79; festucacea, 326, 327; flaccosperma, 380, 401, 440; foenea, 325–328, var. perplexa, 328, C. straminea and C. albicans in Willdenow's Herbarium, 325; Frankii, 382, 402; gracilescens, 252; gravida, var. Lunelliana, 78; Grayii, 382, 402, var. hispidula, 402; hormathodes, 329, var. Richii, 329; intermedia, 78, 326; lagopodioides, 326; laxiflora, 80, var. **serrulata, 80;** Longii, 330; Lunelliana, 79; Meadii, 80; mesochorea, 78; mirabilis, 330; molesta, 252; nigro-marginata, 331; normalis, 330; § Ovales, 327, 328; ovalis, 328; Peckii, 331; pensylvanica, 374, 399; podostachys, 401; retrorsa, 81; Richii, 329; Sartwellii, 78, var. **stenorrhyncha, 78;** scoparia, 327; Shortiana, 81, × C. typhina, 81; siccata, 325–328; squarrosa, 402; stipata, 79, var. maxima, 79; straminea, 326, 327, 329, 330, and C. albicans in Willdenow's Herbarium, Carex foenea, 325, var. aperta, 329, var. foenea, 330; stricta, 401, styloflexa, 80; suberecta, 252, 254; substricta, 252; tenera, 329; tetanica, 80; tonsa, 374, 399; tribuloides, 326; typhina, 81; uberior, 79; umbellata, 374, 399; varia, 331; vulpinoidea, 376, 399; Woodii, 80
Carey (letter), Tuckerman to, 277
Carices, 277, 328, 376
Carphephorus bellidofolius, 366, 448, 458; junceus, 321; tomentosus, 367, 370, 458
Carpinus caroliniana, 146
Caryophyllaceae, 212, 213
Catalogue of the Flowering Plants of Missouri, Validation of Combinations in Palmer and Steyermark's Annotated, 131
Cat-tail, 183
Caucalis Anthriscus, 291; japonicus, 291
Cedar, 429
Cedars, 426
Celastrus orbiculatus, 365, 440
Cenchrus incertus, 390
Cenomyce cornuto-radiata, 21; squamosa muricella, 14
Centipeda minima, 219, 220; in Wellesley, Massachusetts, Occurrence of, 219; orbicularis, 220
Central Massachusetts, The Relation of Pinus rigida to Physiographic Features and Soil Types in, 72
Cephalanthus, 76, 252, 389, 414, 447; occidentalis, var. pubescens, 458
Cerastium, 213, 373; tetrandum, 373, 415; viscosum, 372, 373
Ceratites capitata, 1
Cercis, 372

Cerothamnus pumilus, 409
Chaerefolium Anthriscus, 291
Chaerophyllum procumbens, 448; Tainturieri, 448
Chamaedaphne, 149–151, 414; calyculata, 145, 148, 154–156, 158, 160, 163, 169, 170
Cheilanthes, 182; tomentosa, 249
Chenopodium Boscianum, 275
Chiogenes hispidula, 145
Chloris cucullata, 430
Chlorophyceae, 323
Christmas fern, 247
Chromosomes of Kalmiopsis, 278
Chrysogonum virginianum, 375, 472
Chrysopsis, 379, 380, 468; gossypina, 366, 379, 467–469, 484, pl. 531; **Longii, 467,** 468, 475, 484, **pl. 531;** Nuttallii, 468; pilosa, 467–469
Cimicifuga racemosa, 375, 383, 421
Cirsium lanceolatum, 443; muticum, 252, repandum, 380, 477
Cistaceae, 40, 41, 47
Cistus, 38
Cladonia, 5, 6, 25; alpestris, 26; alpicola, 26; apodocarpa, 15; bacillaris, 9, 25, f. abbreviata, 10, f. clavata, 9, f. peritheta, 9, f. pityropoda, 10, f. reagens, 9, f. subtomentosula, 9, f. tenuistipitata, 10; borbonica, f. cylindrica, 24, f. squamulosa, 24; Boryi, f. lacunosa, 12; caespiticia, 14; carassensis, 26; caroliniana, 12, f. fibrillosa, 12, f. prolifera, 12, f. tenuiramea, 12; subgenus Cenomyce, 9; cenotea, 26; subsection Chasmariae, 12; chlorophaea, 6, 16–20, 23, 25, f. carpophora, 17, 20, f. conistea, 18, f. costata, 17, f. homodactyla, 17, f. intermedia, 17, f. lepidophora, 17, 20, f. pachyphyllina, 17, f. peritheta, 17, f. prolifera, 17, 19, f. pseudotrachyna, 20, f. pterygota, 17, 20, f. simplex, 16, 19; subgenus Cladina, 6, 7; subsection Clausae, 15; clavulifera, 5, 15, f. nudicaulis, 15, f. subvestita, 15; section Cocciferae, 9, 10; coniocraea, 23, 25, f. expansa, 23, f. phyllostrota, 23, f. pycnotheliza, 23, f. **stenoscypha, 24,** f. truncata, 23; conista, 18, 21; cornuta *β* Rei, 22; cornuto radiata, 21, 22, 26, f. radiata, 21, 22, f. subulata, 21; cristatella, 25, f. aurantiaca, 12, f. Beauvoisii, 11, f. ochrocarpia, 12, f. pleurocarpa, 11, f. scyphulifera, 11, f. squamosissima, 11, f. vestita, 11; decorticata, 26; delicata, 6, f. quercina, 14; didyma, f. subulata, 11; digitata, 6, 10, 11, 26; fibula, 22; fimbriata, 5, 21, var. apolepta, f. stenoscypha, 24, f. cornuto-radiata, 21, f. stenoscypha, 24; Group Foliosae, 24; Floerkeana, var. carcata, 9, f. squamosissima, 9, var. intermedia, 9; furcata, 12, 25, var. palamaea, 13, var. pinnata, 13, f. foliolosa, 13, f. recurva, 13, var. racemosa, 12, f. corymbosa, 13, f. fissa, 13, f. furcato-subulata, 13, f. racemosella, 13, f. squamulifera, 13, *ζ fissa, subvar. racemosella, 13; glauca, 26; gracilis, var. dilatata, 16, f. squamulosa, 16; Grayi, 6, 18, 20, 23, 25, f. **carpophora, 20,** f. cyathiformis, 19, f. **prolifera, 19,** f. **simplex, 19,** 20, f. squamulosa, 19, 20; impexa, 6, 8, 9, f. laxiuscula, 7, 9; incrassata, 12; macilenta, 6, 11, f. granulosa, 10, f. styracella, 10; mateocyatha, f. leioscypha, 16, f. squamulata, 16; Group Megaphyllae, 15; Group Microphyllae, 12; mitis, 5, 7, 8, f. prolifera, 8; mitrula, 25, f. **epiphylloma, 15,** f. imbricatula, 15; f. microcarpa, 15, f. pallida, 15; multiformis, f. Finkii, 13, f. simulata, 13, f. subascypha, 13; nemoxyna, 22, 23, f. fibula, 22, 23, f. Rei, 22, 23, Norrlini, 26; ochrochlora, 24, 26; Group Ochroleucae, 25; Section Ochrophaeae, 12; papillaria, f. epistelis, 9, f. molariformis, 9, f. papillosa, 9; piedmontensis, f. epiphylla, 25, f. intermedia, 25, f. lepidifera, 25, f. obconica, 25, f. phyllocoma, 25; pityrea, 24, var. Zwackhii, f. squamulifera, 24, f. subacuta, 15, 24; pleurota, 11, 25, f. decorata, 11; Group Podostelides, 15; Subgenus, Pycnothelia, 9; pyxidata, var. neglecta, 16, f. simplex, 16; radiata, 22; rangiferina, 7, incrassata, 7, f. incrassata, 7, f. leucitica, 7, f. prolifera, 7, f. tenuior, 7, f. umbellata, 7; Rei, 22, 23; scabriuscula, f. farinacea, 13; squamosa, 13, f. carneopallida, 14, f. callosa, 14, f. clavariella, 14, f. denticollis,

6, 13, f. frondosa, 14, f. levicorticata, 6, m. pseudocrispata, 14, m. rigida, 14, var. muricella, 14, δ muricella, 14, f. muricella, 14, f. murina, 14, f. phyllocoma, 14, f. phyllopoda, 14, f. squamosissima, 14; subsection Stramineo-flavidae, 11; strepsilis, 24, f. compacta, 24, f. coralloidea, 24, f. glabrata, 24, f. subsessilis, 24; subcariosa, 5, 15, 25, f. evoluta, 15, f. pleurocarpa, 16, f. squamulosa, 16; subsection Subglaucescentes, 9; sylvatica, 5–8, f. prolifera, 8, f. pygmaea, 7, f. setigera, 7, 8, f. sphagnoides, 7; tenuis, 6, 8, 25, f. flavicans, 8, f. setigera, 8; Group Thallostelides, 16; turgida, 15; subsection Unciales, 12; uncialis, 12, f. obtusata, 12, f. setigera, 12, f. soraligera, 12, f. spinosa, 12; verticillata, f. apoticta, 16, f. evoluta, 16
Cladoniae, 4, 5, 25; in Connecticut, 5; of Connecticut—III, Notes on the, 4
Cladophora, 235
Cladrastis lutea, f. **tomentosa, 487,** Tomentose Form of, 487
Claytonia missouriensis, 132; multicaulis, var. robusta, 132; robusta, 132; virginica, 415, 483, pl. 516, f. **micropetala, 415,** 483, **pl. 516,** f. **robusta, 132**
Cleistes divaricata, 367, 407
Clematis ochroleuca, 374, 421, 441; versicolor, 71, f. **pubescens, 71;** virginiana, var. **missouriensis, 132**
Clintonia borealis, 145, 163
Cnicus benedictus, 477
Cochlearia aquatica, 132
Coldenia Nuttallii, 487; in Missouri, 487
Collinsonia canadensis, 382, 456; parviflora, 45
Combinations in Palmer and Steyermark's Annotated Catalogue of the Flowering Plants of Missouri, Validation of, 131
Combretaceae, 35
Commelina crispa, 131; erecta, var. **crispa, 131**
Compositae, 149–153, 162, 167, 170, 171, 173, 293, 356; sp., 167, 169, 170
Composites, 146
Comptonia, 379, 380, 410; asplenifolia, 379; Ceterach, 412; peregrina, 412, 482, pl. 514, var. **asplenifolia, 410,** 412, 482, pl. 514, var. tomentosa, 412
Concerning the Gaspesian National Park, Regulations, 244
Concord, Massachusetts, Persistence of Opuntia humifusa in, 486
Congress (Notice), Nomenclature at the next International, 464
Connecticut—III, Notes on the Cladoniae of, 4
Conopholis americana, 382, 456, 464
Conophora, 356
Contributions from the Gray Herbarium of Harvard University No. CXXI, 29–69, 87–131, pls. 488–491; No. CXXII, 281–323, 331–358, pls. 494, 497–507; No. CXXIII, 364–424, 434–459, 467–485, pls. 509–535
Convallaria, 405; racemosa, 405–407, 482, pl. 512
Coptis trifolia, 145, 290
Coreopsis, 370, 379, 383; auriculata, 374, 382, 441, 476, 477, 485, pl. 535; callosa, 473; corninsularis, 476; coronata, 349; debilis, 476; § Eucoreopsis, 475; falcata, 474, 484, pl. 534; gladiata, 370, 473, 474, 484, pl. 534; grandiflora, 383, 475, 476, 485, pl. 535; **heterogyna, 475,** 476, 484, **pl. 535;** heterolepis, 476; intermedia, 476; lanceolata, 383, 476, 485, pl. 535, var. villosa, 475; linifolia, 473, 474; longifolia, 474, 484, pl. 534; mitis, 351; **oniscicarpa, 472**–474, 484, **pl. 533, 534;** pubescens, 475, 476; trichosperma, 350, 351, var. tenuiloba, 350, 358, pl. 506
Coriophyllum, 27
Coriophyllus, 27
Cornus, 146, 273; canadensis, 148, 163, var. intermedia, 273, 274; florida, 372, 463, f. **rubra, 133,** var. rubra, 133; stolonifera, 161; suecica, 276
Cory, V. L., Notes on Ephedra in Texas, 215
Corylus americana, 145; cornuta, 145
Crataegus, 372; angulata, 133; arborea, 132; atrorubens, 133; Barrettiana, 132; bellica, 132; brachypoda, 133; bracteata, 133; calpodendron, var. **hispidula, 133,** var. **obesa, 133;** collina, var. **secta, 132,** var. **sordida,**

132, var. **succincta, 132**; crus-galli, var. **Barrettiana, 132,** var. **bellica, 132,** var. **leptophylla, 132,** var. **macra, 132,** var. **pachyphylla, 132,** f. **truncata, 132**; disjuncta, var. **magnifolia, 133**; dumetosa, 133; hispidula, 133; lanceolata, 132; leptophylla, 132; lutensis, 133; Mackenzii, var. **bracteata, 133**; macra, 132; magnifolia, 133; mollis, f. **dumetosa, 133**; obesa, 133; ovata, 132; pachyphylla, 132; paradoxa, 132; pertomentosa, 133; pruinosa, f. **angulata, 133,** var. **brachypoda, 133**; pyracanthoides, var. **arborea, 132**; regalis, var. **paradoxa, 132**; secta, 132; sordida, 132; succincta, 132; succulenta, var. **pertomentosa, 133**; truncata, 132; viridis, var. **atrorubens, 133,** var. **lanceolata, 132,** var. **lutensis, 133,** var. **ovata, 132**

Crotalaria, 361, 362; angulata, 436; cuneifolia, 363; macrophylla, 363; Purshii, 378, 436; retusa, 361, 362; Retzii, 363; rotundifolia, 436; sericea, 362, 363; spectabilis, 361–363, 372, 436, in Southeastern Missouri, On the Occurrence of, 361

Cruciferae, 294

Cryptotaenia canadensis, 382, 448

Ctenium aromaticum, 367, 387

Cuscuta cuspidata, 276

Cuthbertia graminea, 181, 366

Cynanchum carolinense, 285; obliquum, 287; suberosum, 284

Cynoglossum boreale, 274

Cyperaceae, 153, 327; sp. 169, 170

Cyperus acuminatus, 28; filiculmis, var. oblitus, 366; globulosus, 391; oxylepis, 358, in the United States and Mexico, 358; pilosus Vahl in the United States, 74

Dactylis glomerata, 74, var. ciliata, 386

Datura inermis, 184; Stramonium, 184, var. β chalybea, 184, var. **inermis, 184,** var. β Tatula, 184, var. Tatuloides, 184; Tatula, 184

Delphinium azureaum, var. **Nortonianum, 132,** Nortonianum, 132.

Dennstaedtia punctilobula, 383, 385

Dentaria laciniata, 375, 421, 422, var. **coalescens, 421,** 422, 483, **pl. 520,** var. latifolia, 253

Dermestes, 1

Deschampsia flexuosa, 279, 382, 387

Desmodium, 366; ciliare, 437, var. **lancifolium, 437,** 475, 483, **pl. 523**; obtusum, 437; pauciflorum, 422, 436; rhombifolium, 367; tenuifolium, 436

DeToni, Giuseppe, A Note on Phycological Nomenclature, 27

Dichodontium, 359

Dichothrix sp., 235

Dichrocephala Schmidii, 220

Dichroma caespitosa, 391

Dicranaceae, 359

Dicranodontium, 359

Dicranoweisia, 359

Dicranum, 359

Digitaria Ischaemum, 369, var. mississippiensis, 250, 369, 387; serotina, 370, 387

Diodia teres, var. hystricina, 372, 458

Diodonta coronata, 349

Dioscorea hirticaulis, 367

Diplotaxis muralis, 276

Dirca, 383; palustris, 73, 145, 383, 447

Disputed Name, Thalictrum polycarpum S. Wats., a, 317

Dondia linearis, 182

Dormancy of Seeds (Notice), 324

Downingia elegans, 311

Draba brachycarpa, 364, 421; caroliniana, 181

Drepanocladus, 155; revolvens, 155, 167; Wilsoni, 155, 167

Drosera brevifolia, 378, 423; capillaris, 423; section Indicae, 61; intermedia β corymbosa, 333, f. **corymbosa, 333,** subvar. corymbosa, 333

Drouet, Dr. Francis (dedication of genus to), 27; Oscillatoriaceae of Southern Massachusetts, 221–241, 255–273; Some Myxophyceae from Nantucket Island, Massachusetts, 74; Taylor's Marine Algae (Review), 323

Drouetia, 27; coalescens, 27

Dryopteris celsa, 375, 382–384; cristata, 248; spinulosa, 248

Duchesnea indica, 443

Dyal, Sarah C., Additional Notes on the Valerianellas of North America, 465; Valerianella in North America, 185

Eastern North America, On Houttuyn's Overlooked Binomials for Native or Introduced Plants in, 288
Eaton, R. J., Another New Hampshire Station for Rhododendron maximum, 461; Persistence of Opuntia humifusa in Concord, Massachusetts, 486
Echinacea purpurea, 71, var. **arkansana, 71**
Echinochloa Walteri, 146, 275
Echinodorus tenellus, 27; a correction, 27
Echinospermum, 341; deflexum, 341, var. americanum, 341; Virginicum, 341
Eleocharis, 86, 249, 378; capitata, 378, var. verrucosa, 378; Engelmanni, 391; equisetoides, 251; melanocarpa, 371, 391; ovata, var. Heuseri, 275; olivacea, 275; tenuis, 378; tricostata, 371, 391; Wolfii, 86, 251
Elymus riparius, 250, 386; villosus, 382, 386, f. arkansanus, 382, 386
Empetrum nigrum, 463
Enslenia albida, 282
Enteromorpha, 268
Ephedra, 215, 216; antisyphilitica, 215–217, var. brachycarpa, 218; in Texas, Notes on, 215; nevadensis, 215–217; **Reedii, 216,** 217; texana, 215, 216
Epigaea repens, 148, 449
Epilobium, 433; coloratum, 431, 433
Equisetum hyemale, var. affine, 385; variegatum, 248
Eragrostis hypnoides, 369; peregrina, 386; pilifera, 331; trichodes, var. **pilifera, 331**
Erianthus brevibarbis, 390, 391; compactus, 367, 390; giganteus, 390; strictus, 371, 390
Ericaceae, 149–153, 162, 174; sp., 167, 169, 170
Erigeron acris, 344–346, 358, pl. 505, var. arcuans, 345, 347, var. asteroides, 344, 346, var. droebachensis, 344, 346, var. oligocephalus, 344, 345, 347; alpinus, 345, 347, γ elata, 345, var. β, 345, var. elatus, 345, var. γ elatus, 345–347; armeriaefolius, 344, 347; asteroides, 344, 346; borealis, 345, 347, 358, pl. 505; droebachensis, 344, 346; elatus, 345–347, 358, pl. 505, var. **oligocephalus, 344,** 346, 347, 358, pl. 505; elongatus, 344–346, 358, pl. 505; glabratus, 346; lapiluteus, 344, 346; lonchophyllus, 344–347, var. laurentianus, 346, 347; philadelphicus, 471; pilosum, 468; pulchellus, 422, 471; racemosus, 347, f. **discoideus, 347,** var. discoideus, 347; strigosus, var. discoideus, 347; § Trimorphaea, 344, 346; vernus, 379, 471; yellowstonensis, 344, 346
Eriocaulon septangulare, 146
Eriophorum virginianum, 290; virginicum, 290
Eryngium aquaticum, 447; yuccifolium, 379, 447
Euonymus atropurpureus, 382, 440
Eupatorium 86, 159; ageratoides, 293; altissimum, 293; falcatum, 458; fistulosum, 458; leucolepis, 368; purpureum, 382, 458; rugosum, 293; serotinum, 86, var. **polyneuron, 86;** trifoliatum, 382, 458; urticaefolium, 293
Euphorbia, 135, 180; corollata, 253, 463, var. mollis, 253; dentata, 135, 136, and Salsola collina in Minnesota, 135; Ipecacuanhae, 448; obtusata, 377; petaloidea, 276; polygonifolia, 44
Evans, Alexander W., Notes on the Claydoniae of Connecticut—III, 4
Evolvulus pilosus, 181
Extension of Range of Pinus Banksiana in New York, Western, 241; of Range of Ranunculus Purshii, 248
Extensions in the Maine Flora—II, Northeastward, 245; of Ranges and Additions to the Minnesota Flora, 275

Fagus, 383, 447; grandifolia, var. caroliniana, 412, f. mollis, 253
Farwell, O. A., Rare Plants in Michigan, 134
Featherly, H. I., New Triodia from Oklahoma, 243
Features and Soil Types in Central Massachusetts, The Relation of Pinus rigida to Physiographic, 72
Fedia, 187, 188; amarella, 196; canaliculata, 199; chenopodifolia, 195, 196; Fagopyrum, 195, 196; longiflora, 211, 212; Nuttallii, 208; olitoria, 191; patellaria, 188, 193, 194; radiata, 188, 204, β

? leiocarpa, 206; stenocarpa, 199; triquetra, 195, 196; umbilicata, 188, 194, 195; Woodsiana, 192
Fernald, M. L., Anaphalis margaritacea again, 218; Datura Stramonium, var. inermis, 184; New Species, Varieties and Transfers, 331; Noteworthy Plants of Southeastern Virginia, 364–424, 434–459, 467–485, pls. 509–535
Ferns, (Review) Wherry's Guide to, 247
Festuca myuros, 459; rubra, 250, var. lanuginosa, 250
Fimbristylis capillaris, 395
Fischerella, 224
Flora of North America, Moss (review), 359; Nova Scotia, Notes on the, 273; of Western Massachusetts, An unexpected Addition to the, 424
Flowering Plants of Missouri, Validation of Combinations in Palmer and Steyermark's Annotated Catalogue of the, 131
Form of Cladrastis lutea, Tomentose, 487
Forms from Missouri, New Combinations and Undescribed, 177
Frasera, 356
Fraxinus, 381, 452; americana, 375, 382, 449–451; Americana profunda, 450; biltmoreana, 380, 450; campestris, 453; cinerea, 375; Darlingtoniana, 450, 453; epiptera, 451; fusca, 452; lanceolata, 453; longifolia, 452; Michauxii, 450, 451; pennsylvanica, 450–454, 484, pl. 529, var. **Austini, 452,** 453, **pl. 529,** var. lanceolata, 154, 161, 453; var. **typica,** 452, **453,** pl. 529; profunda, 450, 452, 484, pl. 528, var. Ashei, 450; pubescens, 452; rubicunda, 452; rufa, 452; tomentosa, 450–452, 484, pl. 528
Fremyella grisea, 75
Fucus, 268
Fuirena, 396, 397; hispida, 397, 398; pumila, 397, 398; simplex, 254, var. pumila, 397, 398; squarrosa, 396–398, β pumila, 398
Further Notes on Verbena stricta, forma albiflora, 244

Galardia bicolor, 355
Galathenium floridanum, 479; sanguineum, 481
Galium boreale, var. hyssopifolium, 251; Claytoni, 181, 254; tinctorium, 181, 254; uniflorum, 371, 457
Gaspesian National Park, Regulations Concerning the, 244
Gaultheria procumbens, 148
Gaura, 99
Gaylussacia baccata, 145
Gentianaceae, 356
Genus Lepidospartum, Type of the, 320
Geum canadense, var. brevipes, 417; flavum, 181; virginianum, 181
Glottidium vesicarium, 180
Glyceria, 380; acutiflora, 28; arkansana, 380, 385, 386, 441
Gnaphalium calviceps, 471; margaritaceum, 219; obtusifolium, var. micradenium, 369, 471, var. praecox, 471
Gonolobus, 281–283, 285, pl. 494; Baldwinianus, 286; Baldwynianus, 284, 286, pl. 494; carolinensis, 284–287, pl. 494; **decipiens,** 284, **286,** 287, pl. 494; **gonocarpos,** 283, **284,** pl. 494; hirsutus, 282, 285, 286; laevis, 282–285, var. macrophyllus, 284, 285; macrophyllus, 282–285; obliquus, 284, 287, pl. 494, var. Shortii, 287; Shortii, 284, 287, pl. 494; suberosus, 284, pl. 494; within the Gray's Manual Range, 281
Gramineae, 149–153, 161, 162, 166, 167; spp., 148, 169–171
Grass, 243
Grasses, 146, 180
Gray's Manual Range, Gonolobus within the, 281
Grindelia, 181
Guide to Ferns (Review), Wherry's, 247
Gymnosperms, 145

Hackelia, 342, 343; **americana, 341**–343, 357, pl. 503; deflexa, 341–343, 357, pl. 504, var. americana, 341, 342; virginiana, 343, 358, pl. 504
Halenia deflexa, 274, f. **heterantha, 340,** 341, var. heterantha, 340; heterantha, 340
Hamosa manca, 136
Hapalosiphon, 224
Heat as an Insecticide in the Herbarium, 1
Heaths, 145, 163

Hedeoma camporum, 180
Hedysarum ciliare, 437; obtusum, 437
Helenium nudiflorum, 477
Helianthemum, 29, 30, 35, 41, 57; canadense, 274; tripetalum, 66
Helianthus decapetalus, 290; dodecapetalus, 290; hirsutus, var. **leoninus, 133**; leoninus, 134
Heliopsis helianthoides, 382, 472, var. solidaginoides, 422
Helleborus trifoliatus, 290
Helonias graminea, 354
Hemicarpha micrantha, 462
Hepatica americana, 375, 420
Herbarium, Carex foenea, C. straminea and C. albicans in Willdenow's, 325; of University of Oklahoma—I, Notes from, 425; Heat as an Insecticide in the, 1; of Stephen Elliott, Notes on the Lobelias in the, 175
Hermann, Frederick J., New or Otherwise Interesting Plants from Indiana, 77
Herpophyllon, 27; coalescens, 27
Herpophyllum, 27
Heuchera americana, 375, 423; puberula × H. americana, var. hirsuticaulis, 253
Hieracium florentinum, 482
Hirschfeldia adpressa, 309; incana, 309, var. hirta, 309
History of Vegetation in Northwestern Wisconsin, The Postglacial, 137
Hoary Plantain, 457
Hodgdon, Albion R., A Taxonomic Study of Lechea, 29–69, 87–131, pls. 488–491
Holosteum umbellatum, 372, 373, 415
Hopkins, Milton, Notes from Herbarium of University of Oklahoma—I, 425
Hormidium sp., 76
Hormogoneales, 235
Hottonia inflata, 449
Houstonia longifolia, 382, 458; patens, 458; tenuifolia, 372
Houttuyn's Overlooked Binomials for Native or Introduced Plants in Eastern North America, On, 288
Hudsonia, 35, 41; tomentosa, 35
Hutchinsia calycina, 298, var. β, 300, 301, β americana, 298, var. γ, 300, var. integrifolia, 300, 301
Hybanthus concolor, 375, 382, 447
Hydrangea arborescens, 374, 375, 423
Hydrocoleum, 224, 227; glutinosum, 228–230, 268, 273; Holdenii, 228–230, 268, 273; Lyngbyaceum, 228; majus, 229, 230
Hydrocoleus, 227
Hydrocotyle verticillata, 253
Hydroleucum glutinosum, 75
Hydrophyllum virginianum, 341, f. **simplicifolium, 341, pl. 502**
Hypericum adpressum, 442; denticulatum, var. ovalifolium, 371, 442; nudiflorum, 442; perforatum, 443; prolificum, 382, 442; setosum, 366, 442
Hypheothrix, 225
Hypoxis hirsuta, 462; leptocarpa, 407
Hystrix patula, 375, 387

Impatiens pallida, 179, var. alba, 179; f. **dichroma, 179**, f. speciosa, 179
Inactis, 225
Indiana, New or Otherwise Interesting Plants from, 77
Insecticide in the Herbarium, Heat as, 1
Interesting Plants from Indiana, New or Otherwise, 77
International Congress (Notice), Nomenclature at the next, 464
Introduced Plants in Eastern North America, On Houttuyn's Overlooked Binomials for Native or, 288
Inula gossypina, 468
Iodanthus pinnatifidus, 430
Ionoxalis, 180
Ipomoea lacunosa, f. **purpurata, 454**
Iris Pseudacorus, 279; setosa, var. canadensis, 274
Isoetes, 247
Isolepis, 392, 393; § Bulbostylis, 395; capillaris, 395; ciliatifolius, 391; coarctata, 392; Langsdorffii, 395; stenophylla, 391, 393
Iva oraria, 274
Ivesia Jaegeri, 136

Jack pine, 165
Jack pines, 242
Jennison, H. M., Trillium erectum, var. blandum, var. nov., 485
Jones, George Neville, New Variety of Polygonum from Washington, 359

Juglans amara, 452; cinerea, 146, 375, 412; squamosa, 452
Juncoides echinatum, 84; pilosum, var. michiganense, 404, var. saltuense, 404
Juncaceae, 77
Juncus, 40, 459; articulatus, 460; asper, 460; brachycarpus, 378, 403; brachycephalus, 460, f. **hexandrus, 460;** brunnescens, 71; caesariensis, 460; Elliottii, 381, 403; ensifolius, 71; from Utah, A New, 69; Gerardi, 81; group Ensifolii, 71; interior, 459; macer, 82, f. **anthelatus, 81**–83, f. **discretiflorus, 82,** f. **Williamsii, 82;** nevadensis, 71; repens, 368; saximontanus, 71; scirpoides, 378, 403; secundus, 83; tenuis, var. anthelatus, 81, var. Williamsii, 82, 83; **utahensis, 69,** 71; xiphioides, 71
Juniper, 425, 426, 429
Juniperus, 180; "Ashei," 426; horizontalis, 274; mexicana, 425–427; virginiana, 427
Justicia, 376

Kalmia, 278; angustifolia, var. caroliniana, 449; glauca, 278; latifolia, 278; polifolia, 145
Kalmiopsis, 278; Chromosomes of, 278; Leachiana, 278

Labiatae, 292
Lachnanthes, 61
Lachnocaulon anceps, 402
Lactuca, 479, 481; campestris, 481; canadensis, 480, 481, var. elongata, 481, var. integrifolia, 481, var. longifolia, 481, var. obovata, 481, f. **Steelei, 481,** var. typica, 481; elongata, 481, α longifolia, 481, γ sanguinea, 478, 481; hirsuta, 477–481, f. calvifolia, 478, 481, var. **genuina, 481,** var. **sanguinea, 481,** 482; integrifolia, 481; longifolia, 481; ludoviciana, 481, f. **campestris, 481;** sanguinea, 478–481; Steelei, 481; villosa, 481
Lakela, Olga, Plants New to Minnesota, 279; The Occurrence of Poa Chaixii in America, 73
Laminaria, 26
Lamium amplexicaule, 445
Laportea canadensis, 280, 382, 413
Lappula, 343; americana, 341; brachystyla, 344; deflexa, 341, 342, var. americana, 341; Redowskii, 344
Larisey, Mary Maxine, On the Occurrence of Crotalaria spectabilis in Southeastern Missouri, 361
Larix, 149, 152; laricina, 145, 154, 160, 169, 170
Lathyrus hirsutus, 438
Lechea, 29, 30, 33–35, 38–42, 44, 47, 51, 57, 63, 64, 66, 68, 92, 97, 99, 100, 102, 111, 112, 115, 121, 129, 130; A Taxonomic Study of, 29–69, 87–131, pls. 488–491; brevifolia, 60; section Brevisepalae, 33, 34; cernua, 33, 36–39, 42, 49, 93, 100–103, 130, pl. 490; section Cernuae, 34, 102; chinensis, 29; cinerea, 32, 104–106; cinerea var. Torreyi, 32, 104, 106; cubensis, 31, 32, 34, 42, 49, 93, 101, 103, 104, 130, pl. 490; Deckertii, 33, 34, 38, 42, 48, 93–96, 98, 101, 130; depressa, 66; divaricata, 32, 34, 38, 39, 42, 48, 93, 96–98, 101, 103, 130, pl. 490; section Divaricatae, 34; Drummondii, 31, 33, 50–52, 54, 66; subgenus Eudiexa, 30, 63, 90; section Eulechea, 47; exserta, 33, 34, 62, 65; intermedia, 32, 33, 36, 39, 40, 42, 49, 60, 61, 93, 110, 112, 115, 121–123, 125, 127–129, var. **depauperata,** 35, 36, 49, 120, 124, **127,** 131, **pl. 491,** var. juniperina, 120, 124–126, 128, 129, 131, pl. 491, var. **laurentiana,** 120, 124, **127,** 129, 131, **pl. 491,** var. **typica,** 120, **124,** 125, 129, 131, pl. 491; juncifolia, 90; juniperina, 32, 33, 123, 126, 128; subgenus Lechea, 30; subgenus Lechidium, 32, 37, 40; section Lechidium, 33, 47; Leggettii, 32, 33, 40, 41, 43, 49, 60, 107, 110, 115–117, 121–123, 128, var. intermedia, 125, var. **moniliformis,** 36, 43, 95, 117, **118,** 120, 122, 123 131, pl. 491, var. **ramosissima,** 36, 37, 107, 117, **119,** 120, 123, 131, **pl. 491,** var. **typica,** 36, 93, 111, 115–**117,** 120, 122, 123, 131, pl. 491; section Longisepalae, 33, 34; major, 29, 30, 32, 33, 53, 56, 57, 97, var. β divaricata, 33, 97, var. divaricata, 97, var. α villosa, 33, 54, var. villosa, 54; maritima, 30–33, 35, 36, 39, 40, 49, 60, 61, 93, 107, 109–113, 128, var. interior, 33, 109, 111, var. **sub-**

cylindrica, 49, 101, 108, **109,** 112, var. **typica,** 91, 101, **108,** 109, 112, 131, pl. 490, var. **virginica,** 93, 101, 108, **109,** 111–113, 131, **pl. 490;** subgenus Menandra, 30, 90, 106; **mensalis,** 37, 42, 48, 67, **92,** 93, 101, 130, **pl. 489;** minor, 29–32, 38, 39, 41–44, 48, 54–61, 88, 93, 99, 100, 117, 121, 125, 128, α, 99, f. stricta, 114, var. α, 31, 91, var. β, 31, 88, 91, var. dumosa, 31, 88, var. γ, 88, 91, var. gracilis, 31, 91, 99, var. maritima, 32, 109; moniliformis, 33, 119, 122, 123; mucronata, 54, 56; myriophylla, 33, 94–96, pl. 489; section Myriophyllae, 34; novae-caesareae, 31, 59–61; patula, 31, 33–35, 38, 39, 41, 48, 55, 61, 63–65, 93–95, 98, 107, 113; pauciflora, 60; prismatica, 33, 34, 62–65; racemulosa, 29–32, 41–44, 48, 60, 61, 91, 93, 98–102, 107, 128, 130, pl. 488; **san-sabeana,** 33, 37, 38, 40, 42, 47, **49,** 52, 55, 67, 90, 93, 102, 103, 130, pl. 488; secundiflora, 60, 88, 90; sessilifolia, 63; Skinneri, 66; stellata, 61; stricta, 32, 36, 45, 49, 113–115 120; tenuifolia, 29–32, 35, 37–41, 43, 48, 51, 60, 67, 87, 90–93, 101, 103, 110, 115, 128, 130, var. **occidentalis,** 67, 88, **89,** 92, 93, 101, 130, **pl. 489;** thesioides, 31, 88, 90; thymifolia, 29–32, 59–61, 109, 110, 128; Torreyi, 32, 37, 41, 49, 93, 101, 103–107, 113, 123, 130, pl. 490, var. **congesta,** 37, 45, 101, 103, **105,** 106, 131, pl. 490, var. typica, 42; tripetala, 32, 34, 37, 40, 46–48, 51, 55, 65–69, 93, 130; uniflora, 60, 61; verna, 90; verticillata, 29, 30; villosa, 30–34. 36–40, 48, 51–53, 56–58, 61, 90, 93, 97, 98, 110, 111, 128, var. **macrotheca,** 48, 53, **54,** 55, 58, 130, **pl. 488,** var. **Schaffneri,** 36, 41, 53, **54,** 55, 57, 58, 66, 93, var. **typica,** 34–36, 41, 43, **53**–55, 57, 58, 130, pl. 488

Lecheas, 93, 123

Lechidium, 31, 51; Drummondii, 31, 50, 51

Ledum groenlandicum, 145, 148, 154, 156, 160, 163

Legumes, 146

Leibleinia sp. 235

Lemna, 76

Lemotris hyacinthina, 131

Lepachys, 353; columnaris, var. pulcherrima, 353

Lepidium apetalum, 182; calycinum, 298; campestre, 432; densiflorum, 182

Lepidospartum, 320; squamatum, 320–323, var. obtectum, 322, var. **Palmeri,** 321, **322,** 323; Type of the Genus, 320

Lespedeza, 367; acuticarpa, 437; capitata, 367, 437, var. **hirtiformis, 437,** 475, 483, **pl. 524,** var. longifolia, 437; cuneata, 437; hirta, 367, 437; intermedia, f. Hahnii, 432, 433; leptostachya, 115

(letter), Tuckerman to Carey, 277

Leucobryaceae, 359

Leucobryum, 359

Liatris sp., 156, 158; spicata, 366, 459

Lichen digitatus, 10; fibula, 22; radiatus, 21, 22

Ligustrum vulgare, 443

Lilaeopsis lineata, 463

Lilium canadense, 274

Limnanthemum lacunosum, 338, 340, α, 338, 339, β australe, 339

Linaria vulgaris, 443

Linosyris squamata, 320, 321, var. Breweri, 320, 321, var. Palmeri, 320, 322

Linum San-Sabeanum, 50, 51

Liparis, 249; liliifolia, 252; Loeselii, 251, 252

Lippia lanceolata, 372

Liquidambar peregrina, 379, 411, 412; styraciflua, 452

Litchfield, E. W. and Pratt, W. F., Western Extension of Range of Pinus Banksiana in New York, 241

Lithosiphon, 26

Litosiphon pusillus, 26, 27

Lithospermum arvense, 445

Lobelia, 175; amoena, 175–177; Cardinalis, 175, 176; Claytoniana, 175–177; elongata, 175–177, 181; glandulosa, 175–177; gracilis, 176; inflata, 176; Kalmii, 176; leptostachys, 177; Nuttalli, 176; pallida, 175–177; paludosa, 176, 177; puberula, 175–177, var. glabella, 175, 177; siphilitica, 175, 176; spicata, 177, var. leptostachys, 175, 177, var. originalis, 176, var. scaposa, 176, 177

Lobelias in the Herbarium of Stephen Elliott, Notes on the, 175

Loiseleuria, 278
Lolium perenne, 373
Lomatium, 180
Lonicera, 145; japonica, 443
Lophiola, 273; americana, 274; aurea, 355
Lophotocarpus calycinus f. **fluitans, 177,** var. spongiosus, 462; fluitans, 178
Ludwigia brevipes, 447; sphaerocarpa, var. jungens, 371, 447
Luzula, 83; bulbosa, 372, 403; campestris, 83, var. bulbosa, 83, 84, var. echinata, 83, var. multiflora, 83, 84; carolinae, 403, var. **saltuensis, 404; echinata,** 83, **84,** 85, 403, var. **mesochorea, 84,** 85; multiflora, 83–85, var. **bulbosa, 84,** 85; saltuensis, 404
Lycopodium annotinum, 149–153, 162, 163, 169, 170; clavatum, 149–153, 162, 167, 169, 170; inundatum, 149, 166, 167; lucidulum, 153, 375, 385; obscurum, 149, 163; tristachyum, 385
Lyellia, 359
Lyngbya, 224, 232, 262; aestuarii, 75, 224, 229, 233, 235, 236, f. aeruginosa, 236, f. ferruginea, 236, f. limicola, 228, 236, f. natans, 236, f. symplocoidea, 224, 236; confervoides, 234, 237, 238; Digueti, 234, 235; epiphytica, 233, 235; ferruginea, 236; gigantea, 267; hahatonkensis, 76, 262; infixa, 233, 234, 273; Lagerheimii, 233, 235, 273; lutea, 234, 238; luteofusca, 237; majuscula, 234, 236, 237; nigrescens, var. major, 228; ochracea, 234, 238; semiplena, 234, 237–240, 262; stagnina, 236; tenerrima, 238
Lyngbyas, 236
Lysimachia ciliata, 449; quadrifolia, 290

Maine Flora—II, Northeastward Extensions in the, 245; Plants, Notes on some, 462
Malva borealis, 442; pusilla, 442; rotundifolia, 442
Malveae, 460
Manual Range, Gonolobus Within the Gray's, 281
Marine Algae (Review), Taylor's, 323
Marsilea, 182
Marsiliaceae, 182
Martin, Robert F., A New Juncus from Utah, 69; A New Selenia from Texas, 183; Miscellaneous Notes on United States Plants, 459
McVaugh, Rogers, Notes on the Lobelias in the Herbarium of Stephen Elliott, 175
Massachusetts, An unexpected Addition to the Flora of Western, 424; Occurrence of Centipeda minima in Wellesley, 219; Oscillatoriaceae of Southern, 221–241, 255–273; Persistence of Opuntia humifusa in Concord, 486; Some Myxophyceae from Nantucket Island, 74; The Relation of Pinus rigida to Physiographic Features and Soil Types in Central, 72; Wolffiella floridana in, 76
Medeola virginiana, 290; virginica, 290
Mediterranean Fruit Fly, 1
Melica mutica, 386
Menispermum canadense, 375, 382, 421, 422
Menyanthes punctata, 339; trachysperma, 339, 340; trifoliata, 251, var. minor, 254
Merrill, E. D., On Houttuyn's Overlooked Binomials for Native or Introduced Plants in Eastern North America, 288
Mesadenia, 356; Muhlenbergii, 356; rotundifolia, 356, 357
Mexican cedar, 427
Mexico, Cyperus oxylepis in the United States and, 358
Michigan, Rare Plants in, 134
Microchaete grisea, 75
Microcoleus, 224, 230; chthonoplastes, 231; lacustris, 230, 231; paludosus, 230, 231; tenerrimus, 231, 232; vaginatus, 231, var. Vaucheri, 231, 232
Microcystis, 259; aeruginosa, 259
Milium effusum, 74, 380, 386
Mimulus ringens × M. alatus, 254
Minnesota, Euphorbia dentata and Salsola collina in, 135; Flora, Extensions of Ranges and Additions to the, 275; Plants New to, 279
Miscellaneous Notes on United States Plants, 459
Missouri, Coldenia Nuttallii in, 487; Najas gracillima, in, 28; New Combinations and Undescribed Forms from, 177; Plants New to, 249; Validation of Combinations in Palmer and Steyermark's An-

notated Catalogue of the Flowering Plants of, 131
Mitella nuda, 145
Moneses uniflora, 145
Monocotyledons, 182
Moore, John W., Euphorbia dentata and Salsola collina in Minnesota, 136
Moss Flora of North America (review), 359
Moyle, John B., Notes from the University of Minnesota Herbarium, 275
Muhlenbergia capillaris, 387
Mulgedium floridanum, 479
Museum beetles, 1
Mustards, 306
Myosotis deflexa, 341; versicolor, 455
Myosurus minimus, 372, 373, 420; Shortii, 45
Myrica, 408, 409; asplenifolia, 145, 156, 379, 410–412, 482; cerifera, 408, 409, β media, 409, 410, pumila, 410, γ pumila, 408, 409; Comptonia, 412; Curtissi, 409, 410, var. media, 409, 410; Gale, 145; heterophylla, 409, 410, var. **Curtissi, 410;** peregrina, 412; pensilvanica, 410; pensylvanica, 410; pumila, 408, 409; pusilla, 408, 409, 448; sessilifolia, 409, 410, var. latifolia, 409, 410
Myxophyceae, 232, 236, 240; from Nantucket Island, Massachusetts, Some, 74

Naiadaceae, 183
Najadaceae, 183
Najas, 28, 183; gracillima, 28, in Missouri, 28
Name, Thalictrum polycarpum S. Wats., a Disputed, 317
Names of three Species of Brassica, 306
Nannfeldt, J. A., Nomenclature at the next International Congress (Notice), 464
Nantucket Island, Massachusetts, Some Myxophyceae from, 74
× Narcissus Barrii, 407
Narcissus incomparabilis, 407
Nardus, 134, 135; stricta, 134
National Park, Regulations Concerning the Gaspesian, 244
Native or Introduced Plants in Eastern North America, On Houttuyn's Overlooked Binomials for, 288
Nemopanthus mucronata, 161
Nemophila microcalyx, 375, 454
Neobeckia aquatica, 132
New Combinations and Undescribed Forms from Missouri, 177; Hampshire Station for Rhododendron maximum, Another, 461; Juncus from Utah, 69; or Otherwise Interesting Plants from Indiana, 77; Selenia from Texas, 183; Species, Varieties and Transfers, 331–358, pls. 497–507; to Minnesota, Plants, 279; Triodia from Oklahoma, 243; Variety of Polygonum from Washington, 359; York, Western Extension of Range of Pinus Banksiana in, 241
Nichols, G. E., Moss Flora of North America (review), 359
Nodularia spumigena, var. genuina, 75
Nomenclature, A Note on Phycological, 27; at the next International Congress (Notice), 464
North America, Additional Notes on the Valerianellas of, 465; On Houttuyn's Overlooked Binomials for Native or Introduced Plants in Eastern, 288; (review), Moss Flora of, 359; Valerianella in, 185
Northeastward Extensions in the Maine Flora—II, 245
Nostoc Muscorum, 75
Note on Phycological Nomenclature, A, 27
Notes from the Herbarium of University of Oklahoma—I, 425; from the University of Minnesota Herbarium—I, 275; on Ephedra in Texas, 215; on some Maine Plants, 462; on the Cladoniae of Connecticut—III, 4; on the Flora of Nova Scotia, 273; on the Lobelias in the Herbarium of Stephen Elliott, 175; on the Valerianellas of North America, Additional, 465; on United States Plants, Miscellaneous, 459; on Verbena stricta, f. albiflora, Further, 244
Noteworthy Plants of Southeastern Virginia, 364–424, 434–459, 467–485, pls. 509–535
Nova Scotia, Notes on the Flora of, 273
Nuphar fluviatile, 368
Nuttallia pedata, 461

Nymphaea alba, f. rosea, 368, 415
Nymphaeaceae, 149, 166; sp., 166, 167, 169
Nymphoides, 338; aquaticum, 339; **cordatum, 338**, 339; lacunosum, 338, 339
Nymphozanthus, 148, 155
Nyssa aquatica, 251, 385, 452

Obeliscaria pulcherrima, 353
Obelisteca, 353
Obolaria, 375; virginica, 364, 454
Occurrence of Centipeda minima in Wellesley, Massachusetts, 219; of Crotalaria spectabilis in Southeastern Missouri, On the, 361; of Poa Chaixii in America, The, 73
Octoblepharum, 359
Odontostephana Baldwiniana, 286; carolinensis, 285; decipiens, 286; obliqua, 287; Shortii, 287
Oenothera, 180; caespitosa, 354; missouriensis, 354
Oklahoma, New Triodia from, 243; —I, Notes from Herbarium of University of, 425
Oldenlandia Boscii, 369, 458
Oligotrichum, 359
On the Occurrence of Crotalaria spectabilis in Southeastern Missouri, 361
Oncophorus, 359
Oncostylis, 395
O'Neill, Hugh, Cyperus oxylepis in the United States and Mexico, 358; Cyperus pilosus Vahl in the United States, 74; Heat as an Insecticide in the Herbarium, 1
Oniscus, 474
Ophioglossaceae, 182
Ophioglossum vulgatum, 462
Opuntia, 380, 486; humifusa, 448, 486, in Concord, Massachusetts, Persistence of, 486; vulgaris, 486
Orchis spectabilis, 375, 407
Oreoweisia, 359
Oscillaria, 263
Oscillatoria, 225, 230, 255, 263; sp., 270; Agardhii, 264; amphibia, 232, 265, 269; anguina, 264, 265, 267; angustissima, 264; animalis, 264; Bonnemaisonii, 229; brevis, 76, 266, 269, 270, var. neapolitana, 264, 266, 270; chalybea, 264; chlorina, 265, 269, 273; Corallinae, 268; curviceps, 264; formosa, 267, 271; granulata, 266, 270; Grunowiana, 264; laetevirens, 259, 266, 268, 270; limosa, 264, 268, var. chalybea, 76; luteola, 266, 270; margaritifera, 228, 229, 265, 267, 268; nigra, 264; nigroviridis, 75, 76, 265, 268; Okeni, 264; ornata, 264, 267, 269; princeps, 264, 267, 269; proboscidea, 264, 267; prolifica, 264; rubescens, 264; sancta, 264; splendida, 266, 269; subtorulosa, 231, 263; § Oscillaria, 263; subuliformis, 264, 270; tenuis, 265, 268, var. natans, 269, var. tergestina, 269; terebriformis, 264
Oscillatoriaceae, 221, 232, 266; of Southern Massachusetts, 221–241, 255–273; Tribe Lyngbyeae, 224, 232; Tribe Vaginarieae, 224, 225, 232
Osmorhiza longistylis, var. villicaulis, 383, 448
Osmunda, 182; regalis, 161; virginica, 290
Osmundaceae, 182
Ostrya, 150, 157, 172; virginiana, 170, 382, 412
Ottley, Alice M., Occurrence of Centipeda minima in Wellesley, Massachusetts, 219
Overlooked Binomials for Native or Introduced Plants in Eastern North America, On Houttuyn's, 288
Oxalis, 180; Europaea, var. Bushii, f. vestita, 253
Oxypolis rigidior, 367, 449

Palmer and Steyermark's Annotated Catalogue of the Flowering Plants of Missouri, Validation of Combinations in, 131
Panax trifoliatum, 290; trifolium, 246, 247, 290
Panicum, 367, 370, 372, 388; aculeatum, 333; agrostoides, 369, 389, var. condensum, 390; amarum, 389; anceps, var., 390; boreale, 332; calliphyllum, 250; chrysopsidifolium, 378, 389; clandestinum, 333; Clutei, 333; Commonsianum, 366, 389; consanguineum, 381, 401; cryptanthum, 333; hemitomon, 371, 390; hians, 390; mundum, 332, 333; mutabile, 389; oligosanthes, 250; **recognitum, 331**–333, 357, **pls. 497, 498**; rhizomatum, 390; scabriusculum, 332, 381, 401; sub- § Scoparia, 331, 333; sphaero-

carpum, 333; spretum, 371, 389; villosissimum, var. pseudopubescens, 251; Wrightianum, 389
Paraleucobryum, 359
Park, Regulations Concerning the Gaspesian National, 244
Parnassia grandifolia, 254
Paronychia canadensis, 414
Paspalum, 367, 372, 388; bifidum, 372, 388, 389, var. **projectum, 388,** 482, **pl. 509**; ciliatifolium, 429; dissectum, 369, 370, 387; lentiferum, 367; praecox, var. Curtisianum, 367, 388
Patellaria fusca, f. pyxioides, e. m. perithetum, 18
Pedicularis, 292; canadensis, 456; euphrasioides, 292; labradorica, 292, 293, pl. 495; lanceolata, 252, 254
Pennsylvanian Sharp-keyed Ash, 450
Pentstemon digitalis, 463; oklahomensis, 181; pallidus, 463
Perkins, Anne E., Echinodorus tenellus, a correction, 27; Notes on some Maine Plants, 462
Perry, Lily M., Gonolobus within the Gray's Manual Range, 281
Persea palustris, 421
Persistence of Opuntia humifusa in Concord, Massachusetts, 486
Petasites sp., 163
Phacelia, 374; congesta, 180; dubia, 374, 441, 455
Phaeophyceae, 323
Phanerogamae, 281
Phaseolus polystachyus, 380, 438
Phlox carolina, var. triflora, 381, 454; nivalis, 364, 366, 441, 448, 454
Phormidium, 225, 255, 259, 263; ambiguum, 224, 237, 258, 262, 267; angustissimum, 260, 261; autumnale, 75, 232, 255, 258, 262; Corium, 240, 257, 261; Ectocarpi, 260; favosum, 255, 262; fragile, 256, 260; inundatum, 255, 261; laminosum, 255; luridum, 75, 256, 260; molle, 256, 260, 273; mucicola, 255, 259; papyraceum, 240, 257, 261; penicillatum, 255; persicinum, 256, 259, 260, 270, 273; pulvinatum, 240; purpurascens, 255; Retzii, 241, 258, 262; Setchellianum, 255; subfuscum, 255; submembranaceum, 240, 258, 262, 263; subtorulosum, 263; tenue, 257, 260, 261; tinctorium, 256, 260; Treleasei, 255; uncinatum, 255; valderianum, 257, 261; Woronichinii, 240
Phryma leptostachya, 431
Phycological Nomenclature, A Note on, 27
Physalis, 380; monticola, 380, 456
Physiographic Features and Soil Types in Central Massachusetts, The Relation of Pinus rigida to, 72
Physocarpus opulifolius, 382, 423
Physostegia, 455; denticulata, 455
Picea, 149–153, 157, 161–163, 165, 166, 168, 169, 171–173; canadensis, 73; glauca, 143, 145, 154, 167, 169–171; mariana, 145, 148, 154–156, 160, 163, 167, 169–171
Pinus, 68, 166, 169, 172, 173; Banksiana, 145, 147, 149–153, 155–160, 162, 165, 167, 169–171, 173, 241, 242, in New York, Western Extension of Range of, 241; resinosa, 145, 147–153, 155–162, 167, 169–171, 173; rigida, 72, 241, to Physiographic Features and Soil Types in Central Massachusetts, The Relation of, 72; Strobus, 73, 145–154, 157, 160–163, 167, 169, 170; Taeda, 74
Plagiobothrys leptocladus, 311
Plantago, 373; arenaria, 276; heterophylla, 364, 372, 373, 457; purpurascens, 457; rhodosperma, 457; virginica, 373, 374, 424, 457, 484, pl. 530, var. longifolia, 457, var. progressa, 457, var. **viridescens, 456,** 457, 484, **pl. 530**
Plantain, 424
Plants from Arkansas, Two Undescribed, 71; from Indiana, New or Otherwise Interesting, 77; in Eastern North America, On Houttuyn's Overlooked Binomials for Native or Introduced, 288; in Michigan, Rare, 134; Miscellaneous Notes on United States, 459; New to Minnesota, 279; New to Missouri, 249; Notes on some Maine, 462; of Missouri, Validation of Combinations in Palmer and Steyermark's Annotated Catalogue of the Flowering, 131; of Southeastern Virginia, Noteworthy, 364–424, 434–459, 467–485, pls. 509–535
Plectonema, 222, 224, 232; Wollei, 236
Plectritis, 187

Pleuropterus, 289–291; cuspidatus, 290, 291; Zuccarinii, 290, 291
Poa, 393; Chaixii, 73, 74, 279, in America, The Occurrence of, 73; Chapmaniana, 372, 373, 386; compressa, 443; cuspidata, 386; nemoralis, 74; pratensis, 445
Podophyllum, 374
Pogogyne zizyphoroides, 311
Pogonatum, 359; alpinum, 360; brachyphyllum, 360; capillare, 360
Pogotrichum, 27; filiforme, 26, On, 26
Polemonium occidentale, 280
Polyctenium, 294–296, 303, pl. 496; bisulcatum, 304, 305; Fremontii, 303–305, var. **bisulcatum,** 303, **304,** 305, pl. 305, var. **typicum,** 303, **304,** 305, pl. 496; glabellum, 304, 305; Smelowskia and, 294
Polygala, 377; ambigua, 439; cruciata, 366, var. cuspidata, 366, 439, var. ramosior, 439; Harperi, 439; Pretzii, 335–337, 439; ramosa, 378, 435; ramosior, 366, 439; verticillata, 334–338, 357, 377, 439, 440, pl. 501, var. ambigua, 377, 439, 440, 483, pl. 525, var. **dolichoptera, 439,** 440, 483, **pl. 525,** var. **isocycla, 334**–336, 338, 357, **pl. 501,** var. sphenostachya, 338, 357, pl. 501
Polygonaceae, 290
Polygonatum racemosum, 405; ramosum, 405, 406
Polygonum, 291, 310, 313; § Avicularia, 309; coarctatum, var. minus, 313; confertiflorum, 310–316; cuspidatum, 289–291; Davisiae, 359; **esotericum, 310**–312, 316, 317; from Washington, New Variety of, 359; imbricatum, 312–314, var. Watsoni, 314; japonicum, 290; Kelloggii, 309–317, and its Allies, 309; minimum, 317; minutissimum, 313; Newberryi, 359, var. **glabrum, 359;** pictum, 290; polygaloides, 310, 311, 315; Reynoutria, 290, 291; setaceum, 413, pl. 515, var. **interjectum,** 413, **414,** 483, pl. 515, var. **tonsum,** 413, **414,** 483, pl. 515, var. **typicum, 413,** 482, pl. 515; shastense, 317; Sieboldii, 290; unifolium, 313, 315; Watsonii, 310–314, 317; Zuccarinii, 290, 291
Polypodiaceae, 149, 151–153, 162, 182; sp., 169–171
Polypodium virginianum, 486
Polytaenia, 180
Polytrichaceae, 359, 360
Polytrichadelphus, 359
Polytrichum, 148, 158, 359; gracile, 360; strictum, 154, 156, 158
Pontederia lanceolata, 379, f. brasiliensis, 379, 403
Ponthieva racemosa, 383, 408
Populus deltoides, 383, 408; grandidentata, 160, 242; tremula, 252; tremuloides, 146, 148, 156, 158, 161, 163, 242
Porsild, A. E., Silene Menziesii and Allies in Western Canada, 212
Postglacial History of Vegetation in Northwestern Wisconsin, The, 137
Potamogeton, 368; capillaceus, 367, 385; crispus, 385; dimorphus, 181; diversifolius, 28, 181; panormitanus. 181
Potentilla, 135; argentea, 443; canadensis, 245, 246; gracilis, 280; Hippeana, 135; **Jaegeri, 136;** simplex, 245, var. calvescens, 246
Pratt, W. F. and Litchfield, E. W., Western Extension of Range of Pinus Banksiana in New York, 241
Proserpinaca pectinata, 371, 447
Prunella vulgaris, 134, var. albiflora, 134
Prunus pennsylvanica, 161; virginiana, 146
Psilocarphus globiferus, 311
Pteretis nodulosa, 280
Pteridophyta, 182, 281
Puccinellia, 393; distans, 393
Pyrus arbutifolia, 274; § Malus, 372; serotina, 424
Pyxidanthera, 374

Quercus, 68, 149–153, 157, 162, 166, 169, 172; sp., 167, 169, 170; alba, f. **latiloba, 132,** var. latiloba, 132; borealis, 145, 146, var. maxima, 382, 412; cinerea, 366, 412; discolor, 452; ellipsoidalis, 147, 148, 158–161, 169, 173; falcata, var. **leucophylla, 132,** f. **triloba, 132;** laevis, 366, 412, 448; macrocarpa × Q. bicolor, 253; marilandica, 427; montana, 382, 412; Prinus, 412; rubra, var. leucophylla, 132; Schuettei, 253; stellata, 427; triloba, 132
Quimby, Maynard W., Extension of Range of Ranunculus Pursshii, 248

Radicula aquatica, 132
Range, Gonolobus within the Gray's Manual, 281; of Pinus Banksiana in New York, Western Extension of, 241; of Ranunculus Purshii, Extension of, 248
Ranges and Additions to the Minnesota Flora, Extensions of, 275
Ranunculus abortivus, 374, 416–418, var. **acrolasius,** 417, **418**–420, 483, **pl. 519,** var. eucyclus, 417, 420, 483, pl. 519, var. Harveyi, 417, var. **indivisus,** 417, **418,** 483, **pl. 518,** var. micranthus, 416, var. **typicus, 417**–420; acris, 146; allegheniensis, 416, 483, pl. 517; Allenii, 416, 483, pl. 517; ambigens, 415; bulbosus, 443; delphinifolius, 181; Harveyi, 416, 417, 483, pl. 517; micranthus, 416, 419, 483, pl. 517; nitidus, 417; parviflorus, 373; parvulus, 420; Purshii, 248, Extension of Range of, 248; Sardous, 420
Raphanus albus, 306; arvensis, 307; incanus, 309; orientalis, 307; Raphanistrum, 307, 421, f. sulphureus, 421
Rare Plants in Michigan, 134
Ratibida, 353–355; columnaris, f. pulcherrima, 353, var. pulcherrima, 353; columnifera, 353, f. **pulcherrima, 353,** var. pulcherrima, 353; sulcata, 356
Red cedar, 427
Regulations Concerning the Gaspesian National Park, 244
Relation of Pinus rigida to Physiographic Features and Soil Types in Central Massachusetts, The, 72
Reynoutria, 289–291; japonica, 290, 291
Rhabdoweisia, 359
Rhamnus cathartica, 443
Rhexia mariana, var. purpurea, 368, 447
Rhododendron, 278; § Azalea, 372; lapponicum, 278; Leachianum, 278; maximum, 461, Another New Hampshire Station for, 461; nudiflorum, var. glanduliferum, 449
Rhodophyceae, 323
Rhus, 180; canadensis, var. **serotina, 133**; trilobata, 427; typhina, 146
Rhynchospora cymosa, 398, var. globularis, 368, 398; fascicularis, 398; Harveyi, 398; Nashii, 368; perplexa, 381, 398, 399; Torreyana, 399; Wrightiana, 398
Roland, A. E., Notes on the Flora of Nova Scotia, 273
Rollins, Reed C., Smelowskia and Polyctenium, 294
Roripa **aquatica, 132**
Rosa sp., 156; carolina, 436, var. glandulosa, 380, 436, 441, var. **Lyonii, 133;** dasistema, 133; humilis, 436; Lyonii, 133; palustris, var. **dasistema, 133**
Rossbach, George B., Northeastward Extensions in the Maine Flora—II, 245
Rubus, 145, 161, 378, 435; sp., 156; acaulis, 276; § Arguti, 435; audax, 435; § Cuneifolii, 435; cuneifolius, 378, 435; frondosus, 435; inferior, 435; **Longii, 434,** 435, 483, **pls. 521, 522;** multispinus, 435; occidentalis, 434; phoenicolasius, 434; probabilis, 435
Rudbeckia, 353; columnaris, 354–356; columnifera, 354–356; hirta, var. Brittonii, 472, f. **homochroma, 179,** var. monticola, 472; pinnata, 353
Ruellia, 376
Rushes, 180
Rynchospora capillacea, 254; capitellata, 146

Sabatia difformis, 365; lanceolata, 365
Sabbatia calycosa, 355
Saccharodendron floridanum, 380
Sacciolepis striata, 390
Sagina decumbens, 372
Sagittaria calycina, var. fluitans, 177; graminea, 371, 385; rigida, 28
Salix, 145, 149–153, 155, 156, 162; sp., 148, 156, 159, 160, 163, 167, 169–171; amygdaloides, 276
Salsola, 135; collina, 135, 136, in Minnesota, Euphorbia dentata and, 135
Salvia lanceolata, 276
Sanguinaria, 374; canadensis, var. rotundifolia, 421
Sanicula, 366; gregaria, 382, 448; marilandica, 448, var. **petiolulata, 448,** 475, 484, **pl. 527;** Smallii, 365, 378, 448
Sarracenia flava, 367, 368, 423; purpurea, 145, var. venosa, 367, 423

Saxifraga virginiensis, 375, 423
Scandix Anthriscus, 291
Schizaea, 273; pusilla, 274
Schizothrix, 224, 225; arenaria, 225, 226, 273; subgenus Chromosiphon, 226; Friesii, 226; subgenus Hypheothrix, 225; Purcellii, 226; purpurascens, 226, 227, var. cruenta, 227; subgenus Symplocastrum, 225
Schmaltzia serotina, 133
Schubert, Bernice G., Vernonia fasciculata, var. corymbosa, 220
Schuh, R. E., On Pogotrichum filiforme, 26
Schwalbea, 379; americana, 378, 456
Scirpus, 376, 377, 381; atrovirens, 396, var. **flaccidifolius, 396,** var. georgianus, 77, 376, 396, f. **proliferus, 77;** capillaris, 394, 395, 482, pl. 510; ciliatifolius, 391; Clintonii, 275; coarctatus, 392; divaricatus, 376; fontinalis, 376, 381, 382, 396; georgianus, 396; paludosus, 275; stenophyllus, 391, 393; subterminalis, 251; validus, 28
Scleria oligantha, 399, 440
Scrophulariaceae, 292
Scrophularia lanceolata, 182, 381, 456; leporella, 182
Scutellaria integrifolia, f. **rhodantha, 455;** versicolor, 382, 383, 455
Scytonema, 224; sp., 235; cincinnatum, 75; crispum, 75
Sedges, 159, 180
Sedum Nevii, 364, 423; ternatum, 375, 382, 423
Seeds (Notice) Dormancy of, 324
Selaginella selaginoides, 153, 168, 169, 171
Selenia dissecta, 184, 459; from Texas, A New, 183; **grandis, 183**
Senecio aureus, 374, 422; Muhlenbergii, 356
Serinia oppositifolia, 377, 477
Setaria magna, 372, 390
Silene, 213, 214; caroliniana, 415; latifolia, 214; Menziesii, 212–215, and Allies in Western Canada, 212; **obovata, 214;** stellata, 415; virginica, 380, 415, 441; Williamsii, 214
Silphium atropurpureum, 382, 422, 472; compositum, var. reniforme, 369, 472; reniforme, 369
Sinapis, 306, 307, 309; alba, 306; arvensis, 306–308, var. brevirostris, 308, α integrifolia, 308, β pinnatifida, 308, β Schkuhriana, 308; flexuosa, 307; geniculata, 309; hispida, 307; incana, 308, 309; kaber, 306; laevigata, 307; nigra, 306, 307, 309; orientalis, 307; polymorpha, 307; retrohirsuta, 308; Schkuhriana, 308; taurica, 308; torosa, 307; villosa, 308
Siphonella longiflora, 211; Nuttallii, 208
Sisyrinchium, 249, 381; atlanticum, 252; capillare, 381, 407; mucronatum, 407, 462
Smelowskia, 294–297, 303, pl. 496; americana, 298, 299; and Polyctenium, 294; calycina, 295–297, 299–303, prol. americana, 297, prol. . americana, f. integrifolia, 300, var. **integrifolia,** 297, **300,** 303, var. **typica, 297,** 303, pl. 496; ? Fremontii, 295, 304; Fremonti, 304, var. bisulcata, 304, var. glabella, 304; lineariloba, 298–300, f. virescens, 298, 300; lobata, 298, 300; ovalis, 297, 301–303, var. **congesta,** 297, **302, pl. 496,** var. **typica,** 297, **301**–303, pl. 496
Smilacina ciliata, 406; racemosa, 404–407, 482, pl. 512, f. foliosa, 407, var. **cylindrata, 406, pl. 513,** var. **typica, 407**
Smilax, 180, 365; herbacea, var. lasioneuron, 422; hispida, 382; pulverulenta, 382, 407
Soil Types in Central Massachusetts, The Relation of Pinus rigida to Physiographic Features and, 72
Solanum Dulcamara, 443; rostratum, 459
Solidago, 148, 159, 276, 370, 470; sp., 156, 158; arguta, 366, 469, var. **Boottii, 133;** austrina, 469, 470, 484, pl. 532; Boottii, 133; flavovirens, 469, 470; glaberrima, var. **moritura, 133;** graminifolia, var. polycephala, 368, 471; longipetiolata, 133; moritura, 133; nemoralis, var. **longipetiolata, 133; perlonga, 469,** 470, 475, 484, **pl. 532;** Riddellii, 254; rugosa, var. aspera, 254; series Uliginosae, 470; yadkinensis, 469
Some Myxophyceae from Nantucket Island, Massachusetts, 74
Sonchus floridanus, 479
Sorghastrum Elliottii, 391, 429

Southeastern Missouri, On the Occurrence of Crotalaria spectabilis in, 361; Virginia, Noteworthy Plants of, 364–424, 434–459, 467–485, pls. 509–535
Southern Massachusetts, Oscillatoriaceae of, 221–241, 255–273
Sowbug, 474
Spartina, 229, 230, 236, 268
Species of Brassica, Names of three, 306; Varieties and Transfers, New, 331
Spergula arvensis, var. sativa, 373, 414
Sphagnum, 148–156, 158, 160–163; sp., 154, 158, 167, 169–172
Spiranthes ovalis, 366, 377, 408
Spirulina, 225, 271; densa, 272; Gomontiana, 271; major, 271, 272; Meneghiniana, 271; stagnicola, 271, 272; subsalsa, 76, 271, 272, f. genuina, 272, f. oceanica, 272; tenerrima, 271; tenuissima, 76, 272; Thuretii, 272
Sporobolus uniflorus, 274
Spruce, 143, 165, 276
Stachys Nuttallii, 382, 455
Staphylea trifolia, 382, 440
Station for Rhododendron maximum, Another New Hampshire, 461
Stellaria, 213; aquatica, 280; pubera, 375, 414
Stenanthium gramineum, f. **robustum, 131;** robustum, 131
Stenophragma Thaliana, 445
Stenophyllus, 391–393; antillanus, 392; caespitosus, 391, 393; capillaris, 395, var. cryptostachys, 395, 482, pl. 510; ciliatifolius, 366, 391; coarctatus, 392; floridanus, 392; nesioticus, 392; portoricensis, 392; stenophyllus, 392
Steyermark, Julian A., Coldenia Nuttallii in Missouri, 487; Najas gracillima in Missouri, 28; New Combinations and Undescribed Forms from Missouri, 177; Plants New to Missouri, 249; Tomentose Form of Cladrastis lutea, 487; Two Undescribed Plants from Arkansas, 71; Validation of Combinations in Palmer and Steyermark's Annotated Catalogue of the Flowering Plants of Missouri, 131
Stillingia sylvatica, 366, 380, 440, 448
Strophostyles helveola, 276
Study of Lechea, A Taxonomic, 29
Stylosanthes biflora, var. hispidissima, 438; riparia, 438, f. **ochroleuca, 438,** var. **setifera, 438**
Suaeda americana, 182; linearis, 182
Sugar maple, 431, 433
Svenson, H. K., Carex foena, C. straminea and C. albicans in Willdenow's Herbarium, 325
Sweet Flag, 183
Symblepharis, 359
Symploca, 224, 238; atlantica, 238–240; fasciculata, 240; funicularis, 239; hydnoides, 239, 240, var. fasciculata, 239, 240, var. genuina, 239, 240; muralis, 239, 240, 261; Muscorum, 224, 239, 240, f. genuina, 241, f. inundata, 241
Symplocarpus foetidus, 382, 402
Symplocastrum, 225; Brittoniae, 226
Syrrhopodon, 359

Tagetes patula, 355
Talinum rugospermum, 116; teretifolium, 181
Tanacetum, 220
Taraxacum officinale, 146
Taxonomic Study of Lechea, A, 29
Taxus canadensis, 73, 170
Taylor's Marine Algae (Review), 323
Teesdalia nudicaulis, 373, 421
Tetradymia squamata, 321, var. Breweri, 321, var. Palmeri, 322
Teucrium canadense, var. virginianum, 382, 455
Texas, A New Selenia from, 183; Notes on Ephedra in, 215
Thalictrum ametrum, 319, 320; dasycarpum, 178, f. **hypoglaucum, 178;** Fendleri, 318, 319, var. ? polycarpum, 318, 319; hypoglaucum, 178; multiflorum, 319; polycarpum, 318, 319, S. Wats., a Disputed Name, 317; revolutum, 382, 420
Thaspium barbinode, 375, 382, 449; trifoliatum, 253
Three Species of Brassica, Names of, 306; Transfers, 136
Thuja occidentalis, 145, 161
Thymus Serpyllum, 443
Tilia, 149–151, 157, 172; americana, 146, 154, 156; -Acer association, 73; heterophylla, 375, 382, 441; Michauxii, 375, 441
Tolypothrix, 224
Tomentose Form of Cladrastis lutea, 487

Torilis, 291; Anthriscus, 291; japonicus, 291
Tordylium, 291; Anthriscus, 291
Tradescantia, 180; Ernestiana, 180; ozarkana, 180; rosea, 181, var. graminea, 366, 380, 403, 448; subaspera, 354; Tharpii, 180
Transfers, New Species, Varieties and, 331; Three, 136
Trichostema dichotomum, 366, var. puberulum, 366, 455; foliis setaceis, 292; lineare, 292; setaceum, 292
Trillium, 485; erectum, 486, var. album, 485, 486, pl. 536, var. **blandum,** var. nov., 485, **486, pl. 536;** § Erecta, 485
Triodia flava, 243, 244; from Oklahoma, New, 243; **oklahomensis, 243**
Triosteum aurantiacum, var. **illinoense, 133;** illinoense, 133; perfoliatum, var. illinoense, 133
Triplasis purpurea, 366, 386
Truman, Harry V., Further Notes on Verbena stricta, forma albiflora, 244
Tuberaria, 38
Tuckerman to Carey (letter), 277
Two Undescribed Plants from Arkansas, 71
Typha, 152, 183
Typhaceae, 183
Type of the Genus Lepidospartum, 320

Ulmus americana, 146, 154; fulva, 375, 413
Umbelliferae, 180, 291
Undescribed Forms from Missouri, New Combinations and, 177; Plants from Arkansas, Two, 71
Uniola sessiliflora, 422
United States and Mexico, Cyperus oxylepis in the, 358; Cyperus pilosus Vahl in the, 74; Plants, Miscellaneous Notes on, 459
University of Minnesota Herbarium—I, Notes from, 275; of Oklahoma—I, Notes from Herbarium of, 425
Ustilago, 214
Utah, A New Juncus from, 69
Utricularia geminiscapa, 456

Vaccinium, 154; sp., 148; macrocarpon, 146; pennsylvanicum, 145; Vitis-Idea, var. minor, 163
Valeriana, 187; Locusta α olitoria, 190, 191, ε radiata, 204, var. radiata, 206
Valerianella, 186–189, 192, 196, 199, 212, 466; amarella, 185, 186, 189, 196, 204, 212, 466, pl. 492, 493; **Bushii,** 186, 188, 190, 204, 208–**210,** 211, 212, **pl. 494;** capitata, 192; carinata, 190, 199, 212, 466, 467, pl. 493; chenopodifolia, 186, 189, 195, 203, 204, 212, pl. 493; costata, 192; gibbosa, 192; in North America, 185; **intermedia,** 186, 190, **202,** 203, 212, **pls. 492, 494;** longiflora, 186, 190, 204, 208, 211, 212, pl. 494; Locusta, 190, 191, 199; Nuttallii, 186, 190, 204, 208, 212, pls. 492, 494; olitoria, 187, 189, 190, 192, 212, 467, pl. 492; **ozarkana,** 185, 186, 190, 192, 204, **208,** 212, **pls. 492, 494; Palmeri,** 190, **201,** 202, 212, **pl. 494;** patellaria, 189, 193–195, 212, pl. 493; § Platycoelae, 188; praecox, 199; radiata, 186–188, 190, 193–195, 200–204, 212, pls. 492, 494, var. **Fernaldii,** 190, **207,** 212, **pls. 492, 494,** var. **missouriensis, 190,** 206, 212, **pl. 494,** var. patellaria, 193, var. umbilicata, 194; Section Siphonella, 186–188, 209, 211; stenocarpa, 188, 190, 199, 200, 202, 212, pl. 493, var. **parviflora,** 186, 190, **201,** 204, 212, **pl. 493; texana,** 185, 189, **198,** 212, 465, 466, **pl. 493;** umbilicata, 189, 193–195, 212, pl. 493; Woodsiana, 187–189, 192–195, 200, 204, 212, pl. 493, var. patellaria, 193, 194, var. umbilicata, 194
Valerianellas, 186, 188, 465; of North America, Additional Notes on the, 465
Validation of Combinations in Palmer and Steyermark's Annotated Catalogue of the Flowering Plants of Missouri, 131
Vanilla, 458
Varieties and Transfers, New Species, 331; of Bidens coronata, The, 348, pl. 506
Variety of Polygonum from Washington, New, 359
Vaucheria, 229; Thuretii, 273
Vegetation in Northwestern Wisconsin, The Postglacial History of, 137
Verbena angustifolia, 182; brasiliensis, 371, 455; Halei, 181; Haleii,

Missouri Botanical Garden Library
3 1753 00341 3603

181; simplex, 182; stricta, 244, 245, f. albiflora, 244, Further Notes on, 244, f. roseiflora, 245; urticifolia, 455
Vernonia, 220, 357; corymbosa, 220; fasciculata, 220, corymbosa, 220, var. **corymbosa, 220**
Veronica agrestis, 464; arvensis, 443, 445; peregrina, 445; persica, 372; serpyllifolia, 443
Viburnum acerifolium, 382, 458; rufidulum, 448
Vicia angustifolia, 443; caroliniana, 438
Villarsia, 340; aquatica, 339, 340; cordata, 338, 340; lacunosa, 338–340; trachysperma, 340
Vincetoxicum, 281–283; acanthocarpos, 282, 285; Baldwinianum, 286; carolinense, 285, 286; gonocarpos, 282–284; obliquum, 287; Shortii, 287; suberosum, 284
Viola, 375, 443–445; affinis, var. chalcosperma, 442; arvensis, 444–446; bicolor, 443, 444; emarginata, var. acutiloba, 442; esculenta, 375, 442; hirsutula, 364; Kitaibeliana, 445, 446, 483, pl. 526, var. **Rafinesquii, 443,** 446, 483, pl. 526; lanceolata, 443, var. vittata, 443; Langloisii, var. pedatiloba, 375, 442; Rafinesquii, 443–446; tenella, 443; tricolor, var. arvensis, 444
Virginia, Noteworthy Plants of Southeastern, 364–424, 434–459, 467–485, pls. 509–535
Vitis, 180; cinerea, 377, 441, var. floridana, 377, 441; Simpsoni, 377, 441; vulpina, 375, 441

Wallace, George J., An unexpected Addition to the Flora of Western Massachusetts, 424
Washington, New Variety of Polygonum from, 359
Weatherby, C. A., Wherry's Guide to Ferns (review), 247
Wellesley, Massachusetts, Occurrence of Centipeda minima in, 219
Western Canada, Silene Menziesii and Allies, in, 212; Extension of Range of Pinus Banksiana in New York, 241; Massachusetts, An unexpected Addition to the Flora of, 424
Wheeler, Louis C., Names of three Species of Brassica, 306; Polygonum Kelloggii and its Allies, 309; Thalictrum polycarpum S. Wats., a Disputed Name, 317; Three Transfers, 136; Type of the Genus Lepidospartum, 320
Wherry's Guide to the Ferns (Review), 247
White cedar, 276
Willdenow's Herbarium, Carex foenea, C. straminea and C. albicans in, 325
Wilson, L. R., The Postglacial History of Vegetation in Northwestern Wisconsin, 137
Wisconsin, The Postglacial History of Vegetation in Northwestern, 137
Wisteria, 372; floribunda, 436; sinensis, 436
Wolffiella floridana in Massachusetts, 76
Woodsia obtusa, 247, 381, 384; scopulina, 247

Xanthoxalis, 180
Xyris ambigua, 368, 403; arenicola, 181; flexuosa, 181; torta, 146, 181, var. macropoda, 368, 402

Yellow Wood, 487

Zannichelliaceae, 183
Zanthoxylum americanum, 463
Zigadenus elegans, 251
Zostera, 26, 229, 236, 238